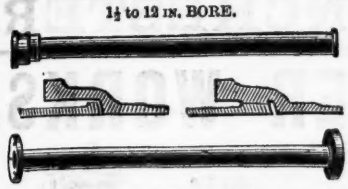
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXV. No. 1674.] LONDON, JUNE 11, 1895. [47TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1½ to 12 IN. BORE.



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The Silver Coin Meter takes **SHILLINGS AND SIXPENCES,** and the Bronze Coin Meter takes **PENNIES AND HALFPENNIES** in the same Slot, and supplies proportionate quantities of Gas.

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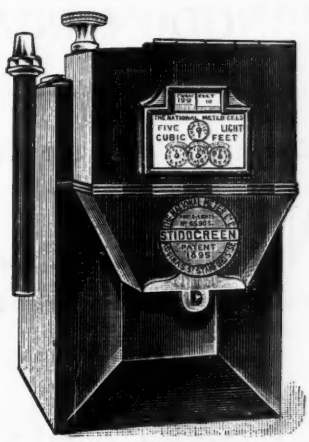

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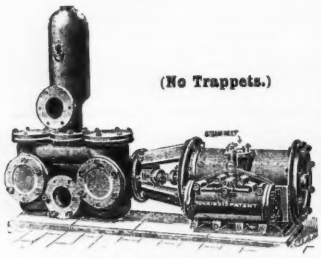

(No Trappets.)

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

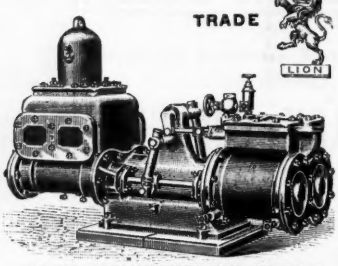

Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

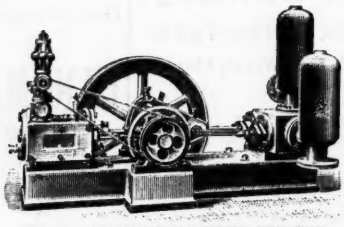

Fig. 683. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

Fig. 705. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

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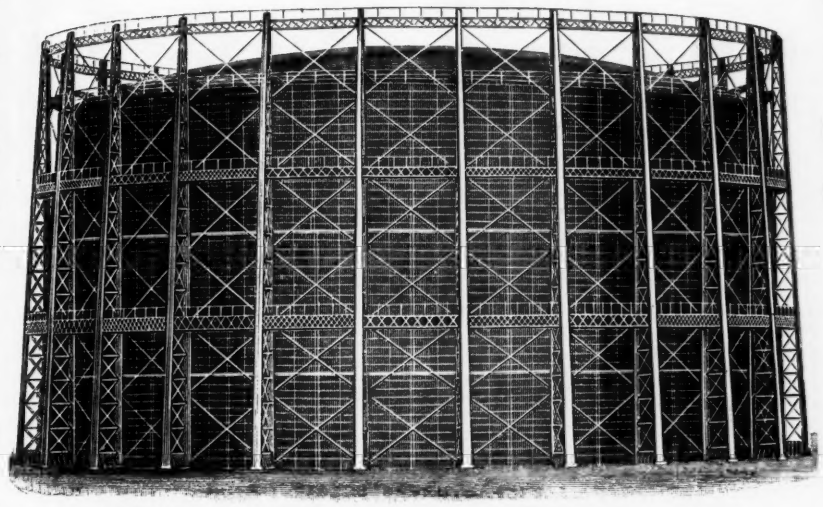

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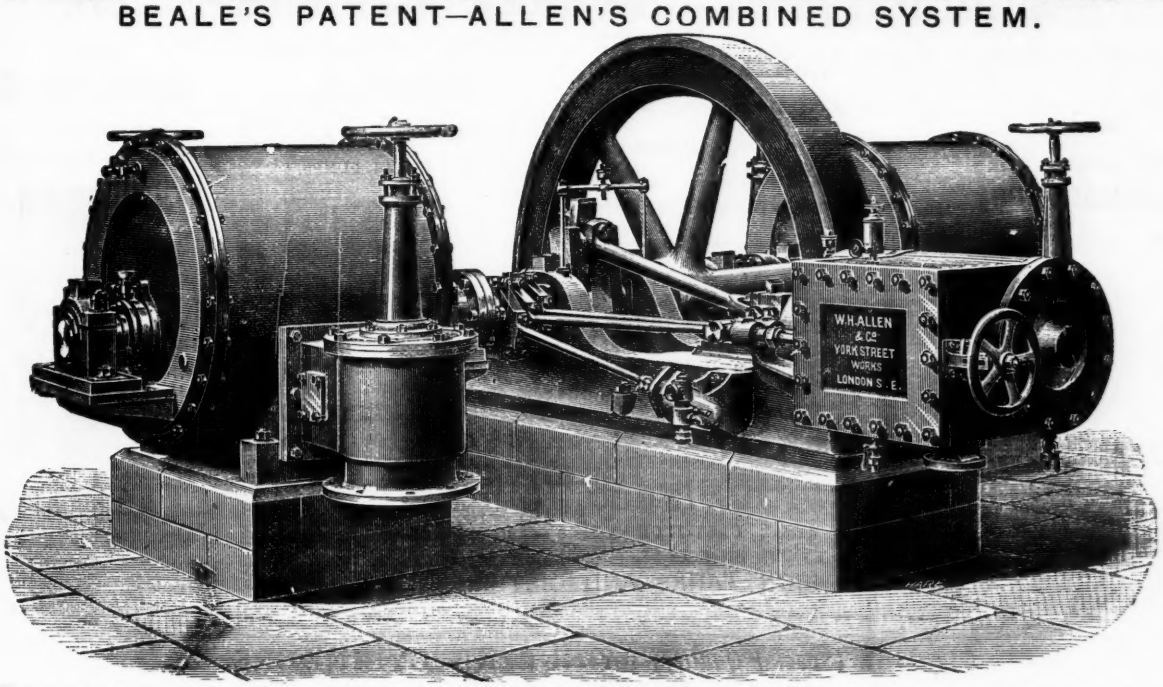

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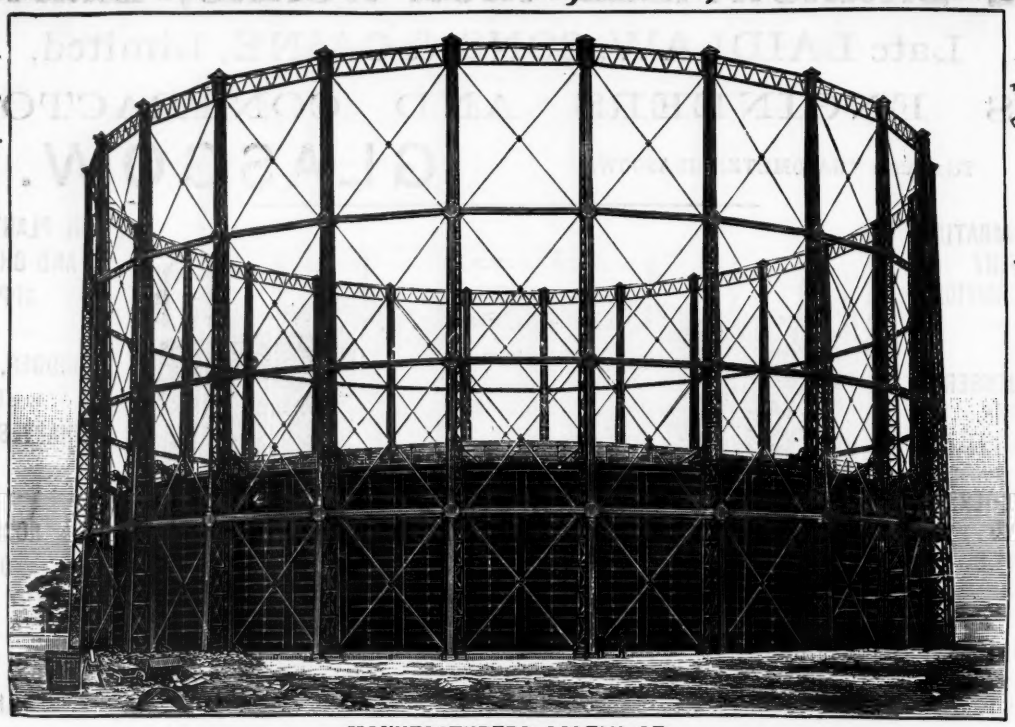

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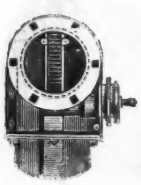

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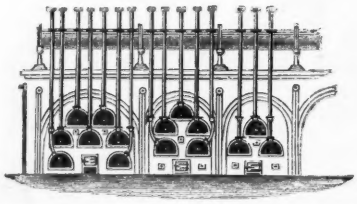

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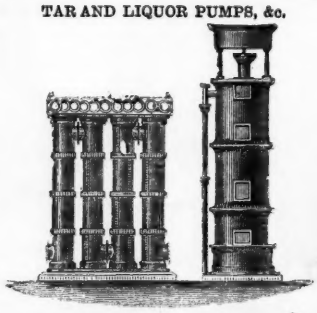

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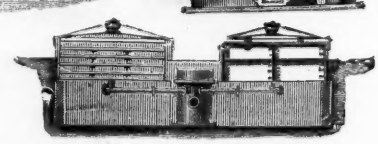

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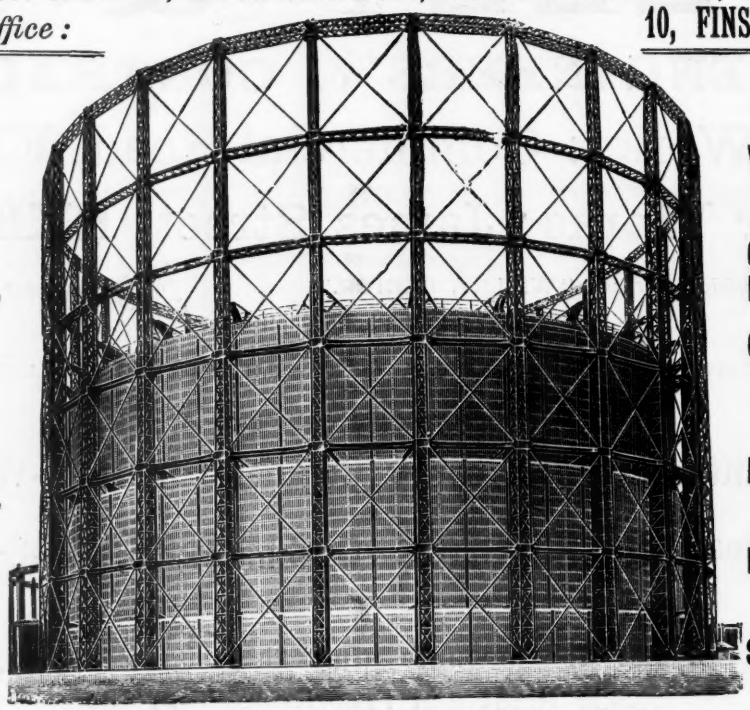

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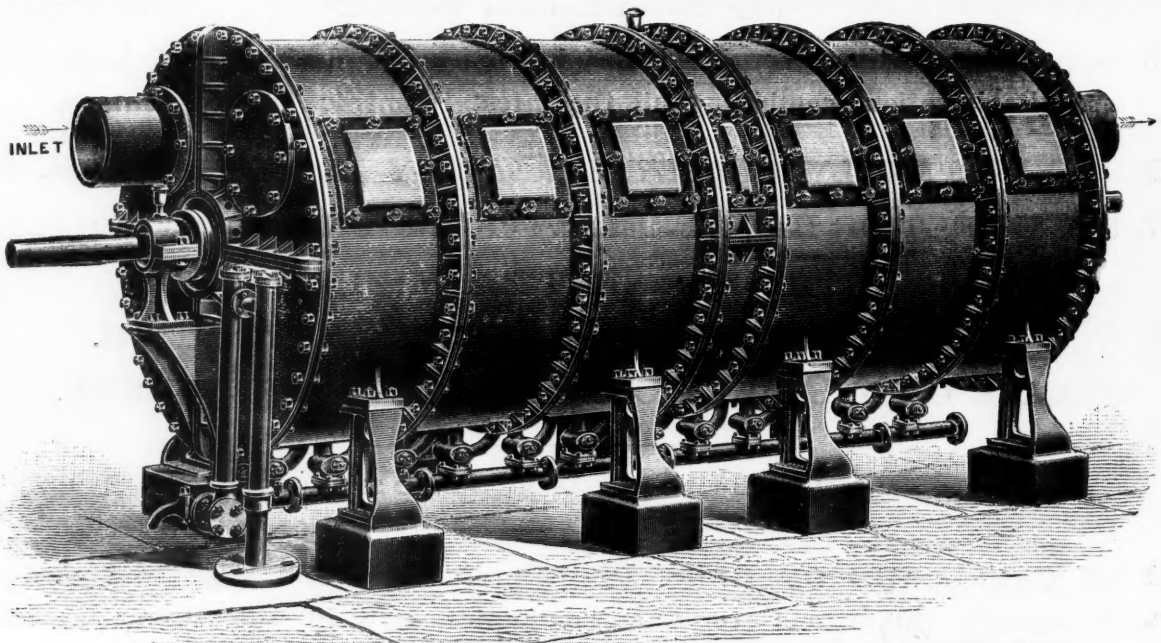

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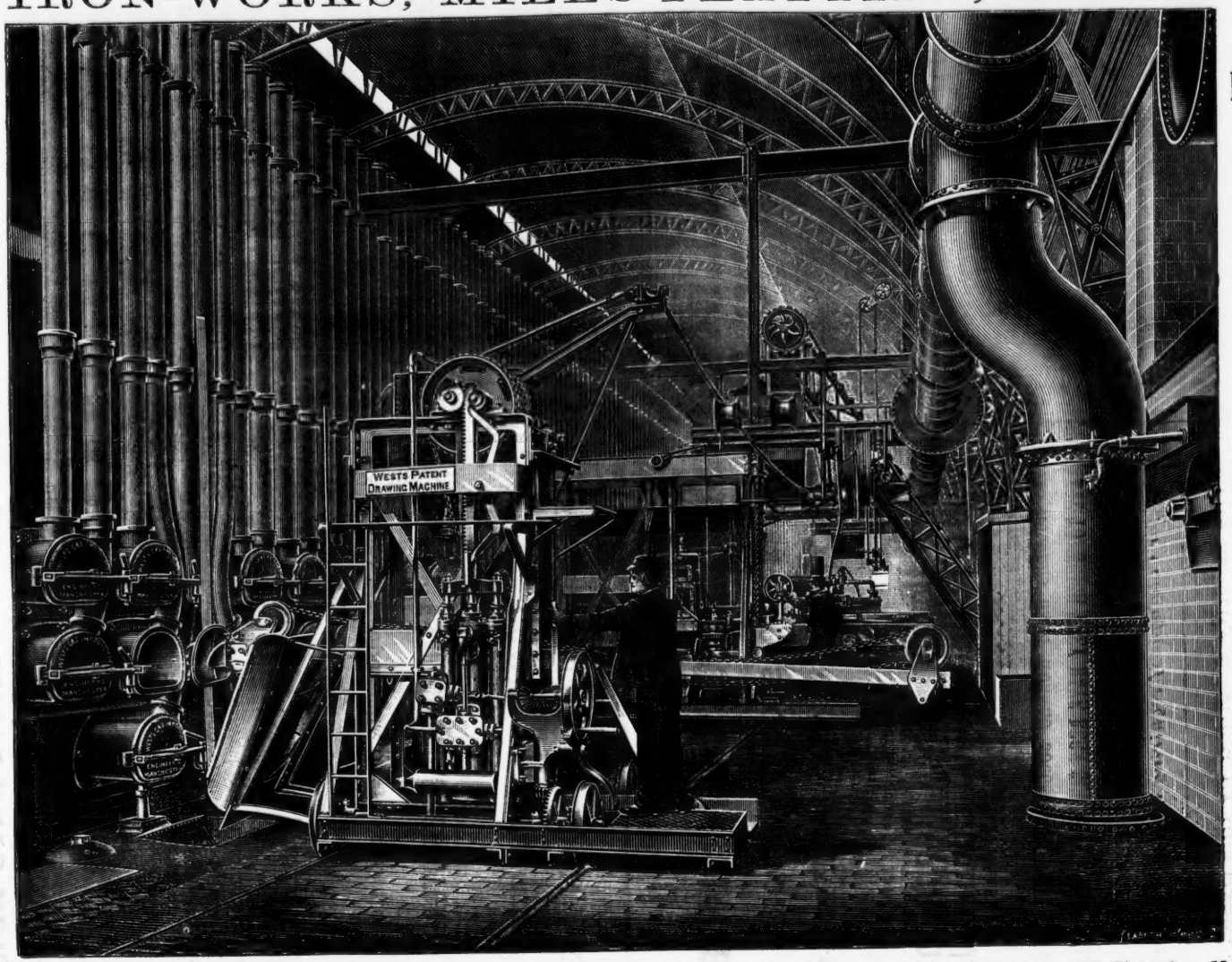

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

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OVER 560,000 LINEAL FEET OF RETORTS DAILY ARE CHARGED AND DRAWN BY WEST'S MACHINES.

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CUBIC FEET OF GAS PER DAY.

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More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital Labour, Fuel, Wear and Tear, &c.

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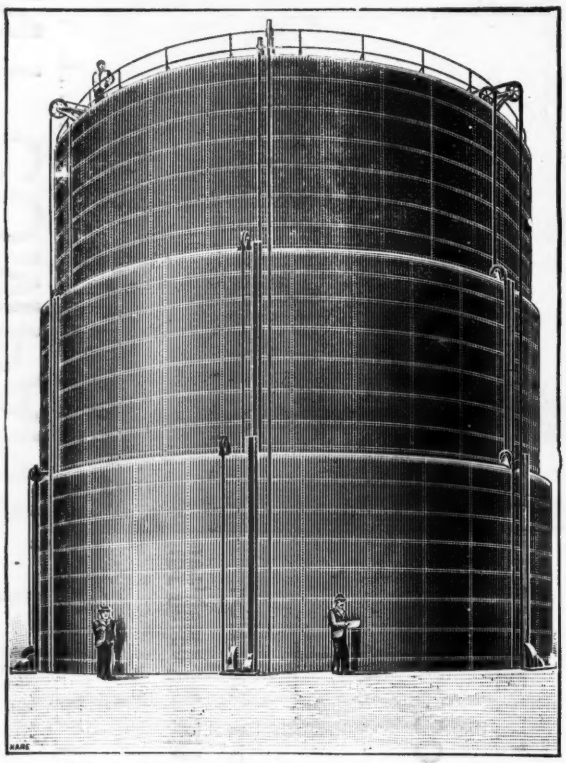

From Photo. of Three-Lift Roped Holder, 50 feet diameter by 18 feet deep each Lift. Erected at Sligo, 1894.

Pease's Patent Roped Gasholders

THESE HOLDERS HAVE WORKED SUCCESSFULLY UNDER EVERY TEST TO WHICH THEY HAVE BEEN SUBJECTED SINCE 1889.

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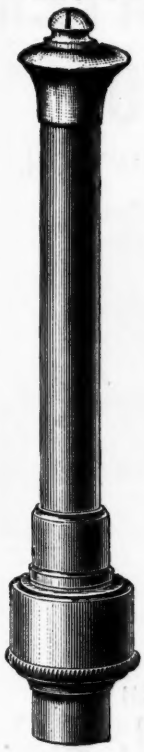

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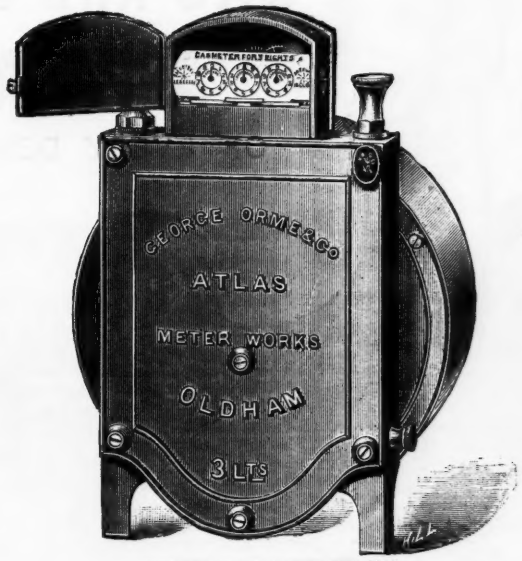
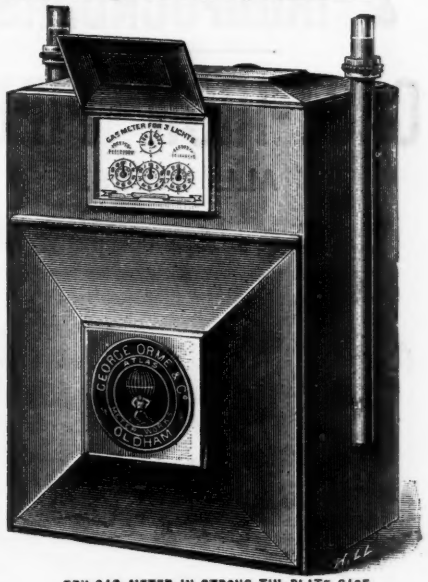


WET GAS-METER IN CAST-IRON CASE.



DRY GAS-METER IN STRONG TIN-PLATE CASE.

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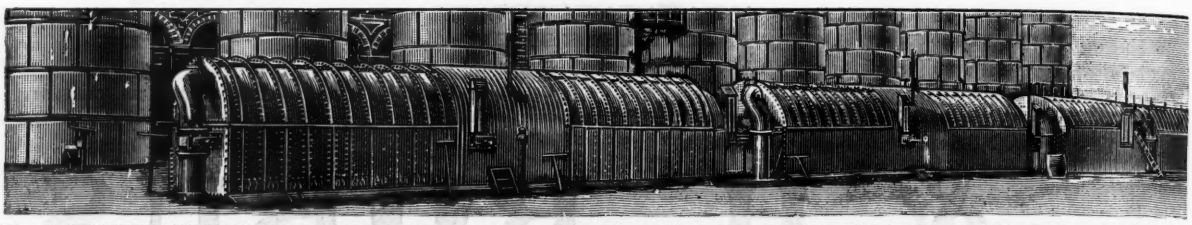
PATENT "STANDARD" WASHER-SCRUBBER

☛ **492** of these Machines (capable of dealing with **472,540,000** cubic feet of Gas daily) in use, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

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This apparatus being made in sections, the capacity can be easily and cheaply made proportionate to increased make of Gas. Other advantages are: Large and effective cooling area on small ground space, slow speed, no repairs required, high strength liquor obtained, &c.

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Extracts practically all the Tar without choking up, and gives minimum back-pressure.

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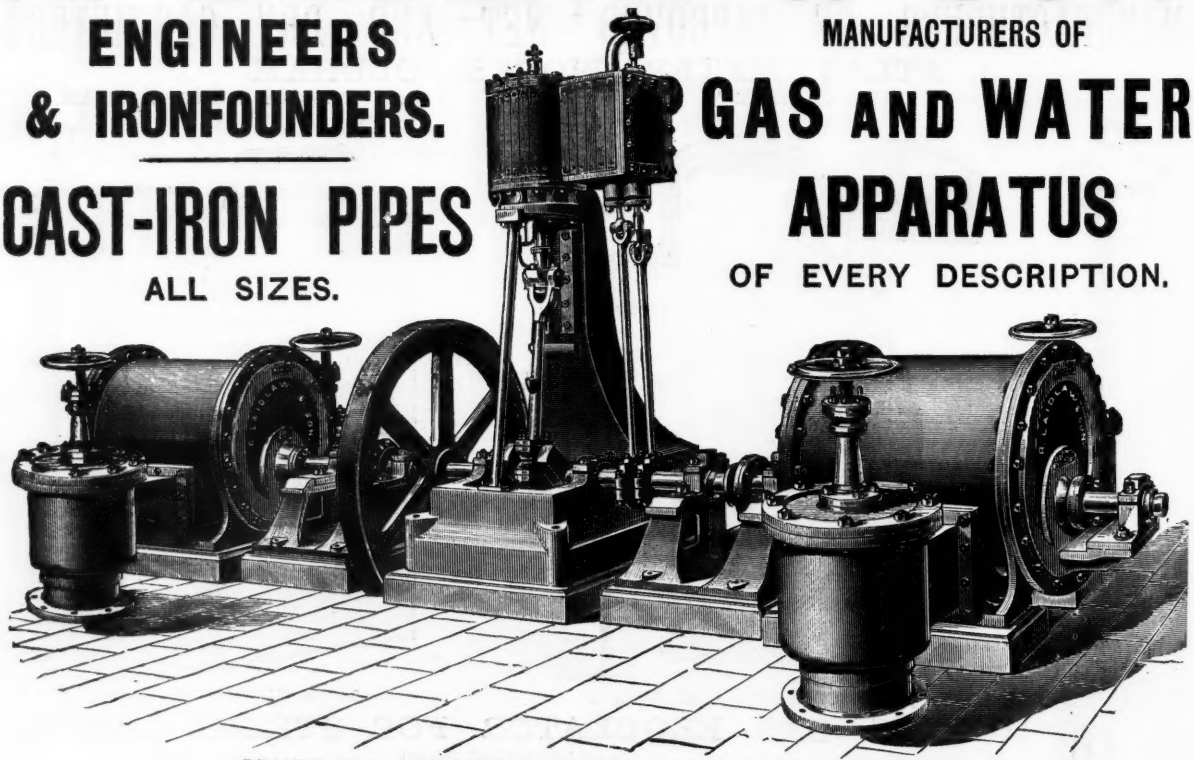

BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED—ALL SIZES.

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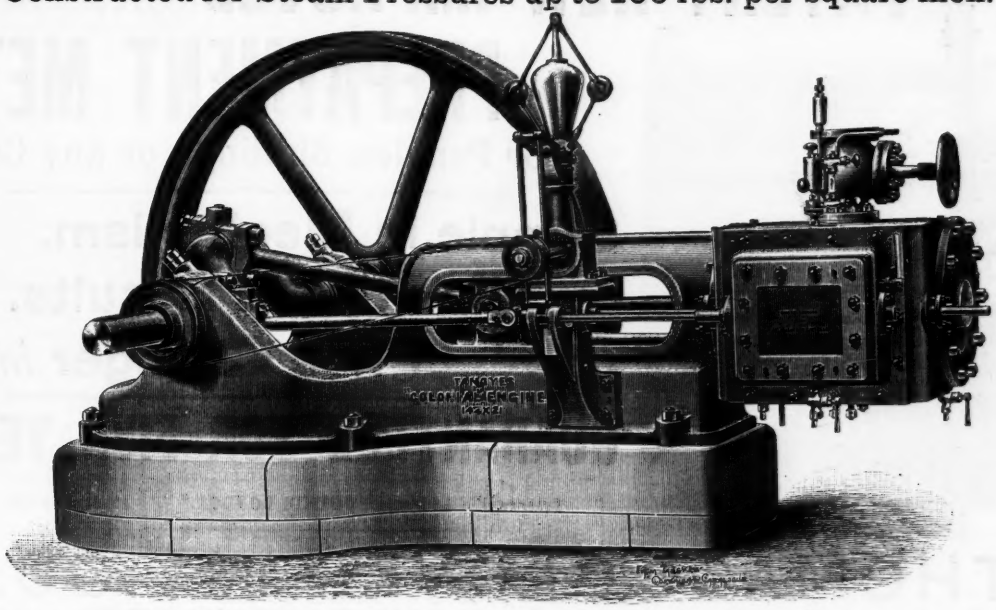
TANGYES'

"COLONIAL" STEAM-ENGINE

Constructed for Steam Pressures up to 100 lbs. per square inch.



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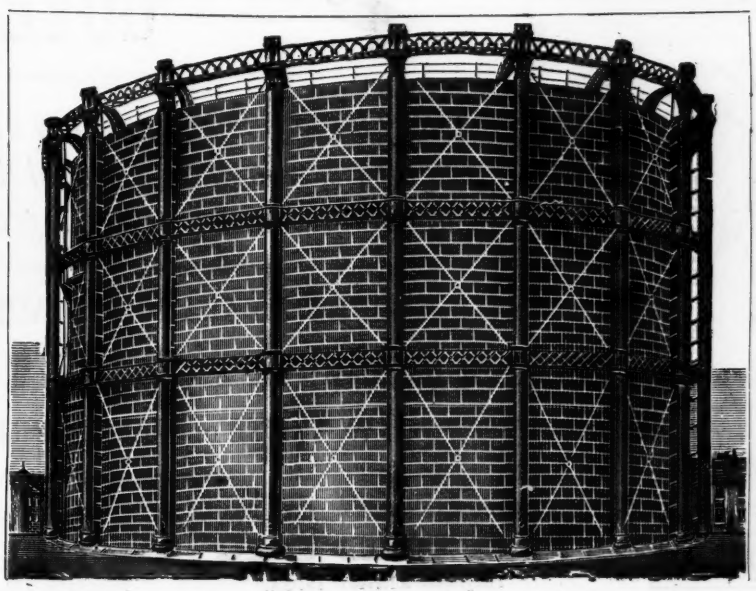

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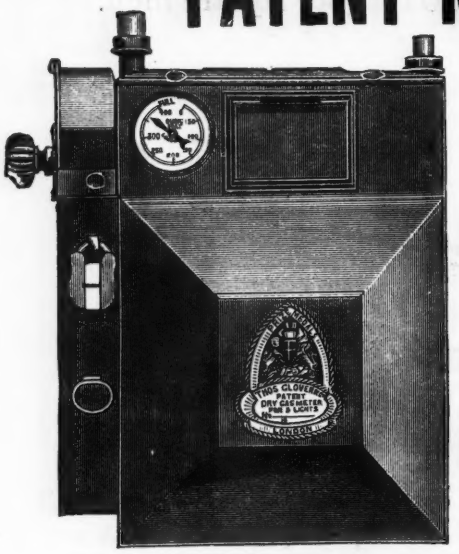

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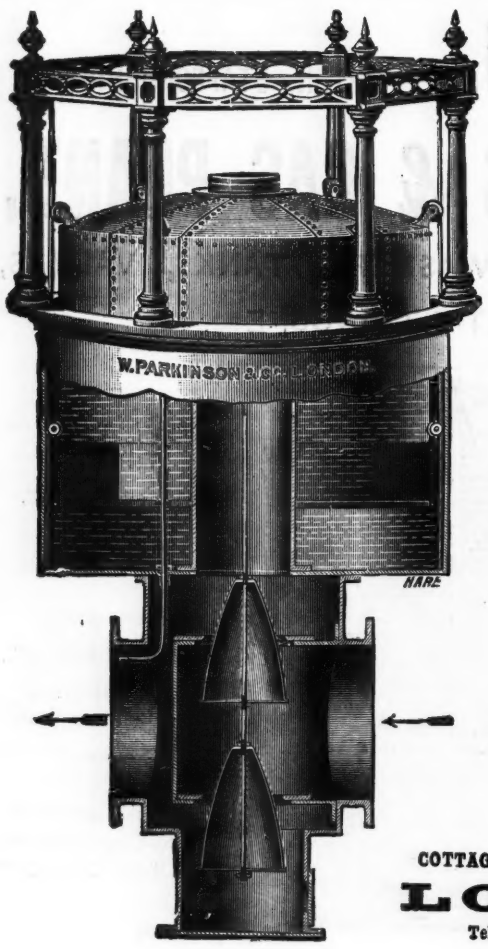

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EDITORIAL NOTES.

Mr. F. D. Marshall and the Monier Arch.

As already explained to our readers, we have held over the publication of Mr. F. D. Marshall's very suggestive paper, read at the recent meeting of the Institution of Gas Engineers, on the use of the Monier system of construction for gas-works purposes, in order that it might be given in its complete form, with all the illustrations and supplementary matter that so greatly enhance its value. This we are able to do in the present number of the JOURNAL; and consequently now will be the time to offer a few remarks upon Mr. Marshall's production, which was assuredly one of the chief features of the meeting.

To begin with, it is only the barest truth to declare that no more original, daring, and even puzzling contribution to the literature of gas engineering construction than Mr. Marshall's paper has seen the light in recent years. Whatever else may be thought of it, the cleverness that inspired the writer is indubitable, for the whole production is a brilliant testimony to the possession by the author of a talent which is not far short of positive genius; and the Institution is to be felicitated upon having secured such a paper for its Transactions. Essentially, the paper has two aspects, not necessarily to be regarded together, although not divided by the author. It is a description of, and a plea for, the Monier system of construction for gas-works purposes; and it also expounds certain original views as to the design of parts of gas-works, which would be equally remarkable however carried out. Coal-stores and tar-tanks do not, in the hands of the ordinary man, lend themselves to the creation of a "sensation." But Mr. Marshall is not at all a person of this character; and accordingly he has been able, in the most natural way, to arrange startling effects out of these commonplace materials. Henceforward, the Marshall type of coal-store will have to be studied by every gas-works constructor who finds himself constrained to make the best arrangements for reducing labour; and the credit for having struck out a fresh line in coal-store design at this time of day is considerable. We shall not linger over this aspect of the paper, but at once proceed to deal with the system of construction adopted so enthusiastically by the author.

The Monier system, whatever Mr. Marshall may have thought, is not strange to readers of the JOURNAL, for whose benefit it was long ago specially described. From time to time, moreover, we publish news of the construction on the Continent of various works upon this system; but still it is novel enough to arouse interest on this score when introduced to a meeting of gas engineers by a professional colleague as an almost ideal method of constructing cheap and strong gas-works' buildings and tanks. British gas engineers are, by training and circumstances, men of solid taste in construction; and the general impression created at the meeting by Mr. Marshall's audacious use of the Monier system was that of addiction to "skimpiness," if not of sheer frivolity upon his part. The proposal to contain coal and tar in apparently flimsy, and certainly thin casings of cement and wire, struck the meeting as trifling—clever, of course, and plausible, but not to be approved off-hand. The buildings of a British gas-works are very differently scantled. The majority of Mr. Marshall's audience were more disposed to shake their heads over his plans than to discuss them.

Here, again, the Monier system is not a single conception. It implies, as now developed, both a principle and a material. In its origin, it meant nothing more than a way of blending iron wire with Portland cement mortar, for the construction of drain-pipes, culverts, and tanks—all of circular cross-section. There was really nothing special about the blending of iron with cement; but the Monier system depended as a speciality upon the way in which this was done. The iron was introduced in a peculiar way, in the form of straight rods. It was a cardinal point with the designer of the system that there should be no crossing of the wires as in ordinary wire netting; the rods being merely tied together with binding wire at the crossings. This was to secure the maximum resistance to all deforming stresses. It was early perceived, however, that arches built in this way

possessed a remarkable degree of strength; and especially that very flat arches, very thin at the crown, withstood altogether unprecedented loads. From this observation sprang the idea, which so greatly puzzled the hearers of Mr. Marshall's paper, that in the Monier arch a new principle in building construction appears—the principle of an arch which has, when loaded, part of its substance under tension. The possibility of this in arches was denied at the meeting, and it is difficult to reconcile with one's conceptions of the nature of arches built of separate pieces. A true arch must have all its pieces in compression, or they could not support each other by their mutual pressure. Some light is thrown upon the puzzle of the Monier arch, however, by considering its low curvation. It is so slightly curved that it suggests a beam as well as an arch; and it is probably correct to regard it as an elastic structure which, under load, presents the characters of both arch and beam—the upper part being in compression, the lower (in which the iron rods are embedded) being in tension, with a neutral line somewhere between. We do not pretend to dogmatize upon the matter; and we have no capacity for assimilating the very indigestible-looking formulæ which set out the strength of Mr. Marshall's examples of Monier arch construction. The great strength of this arch is, however, incontestable; and there is no way of accounting for the fact upon any other hypothesis than the one here suggested. The subject has been discussed with considerable zest wherever two or three of Mr. Marshall's auditory have since met together.

Field's "Analysis" for 1894.

THAT indispensable compendium of gas-supply satatistics—Field's "Analysis"—has appeared in the same form, and with the same wealth of matter between its covers with which the compiler has made students of the British gas industry familiar for some years past. It has been necessary, as before, to preface the work with a brief explanation of the manner in which the fluid enriching material now so largely employed in many English gas-works has been dealt with; but there is no alteration in the tables. In view of recent controversy, it is curious to see the differences that are marked between the coke and fuel returns of the different London and Suburban Companies, who all carbonize pretty much the same kinds of coal. Thus we find the Brentford at the head of the list for coke made, with 13·33 cwt. per ton of coal carbonized. Two other Companies only claim makes of 11·97 cwt. of coke per ton; the average for the London works being 12·30 cwt., and for the Suburban works 12·42 cwt. These are all estimated figures, and probably not one of them is exact, while some must be a considerable distance from the truth. This shows how difficult it is to arrive at a satisfactory determination of coke statistics. Mr. Field does not give the weight of coke actually sold, which would sometimes be a useful figure, as diminishing the uncertainty that haunts the coke-heap and the furnace. The lowest return for fuel is Croydon, with 1·55 cwt. per ton. Here and there one may think to catch a trace of the influence of regenerative or direct firing, as in the case of Croydon; but the figures are not safe to rely solely upon for information in this regard. Turning to another subject, it is time that meter and stove rentals were separated. There are some desperate inequalities in some of the proportional tables. Why, for example, should the net cost of coal be 2s. 11·06d. per ton in the case of The Gaslight and Coke Company, 2s. 8·93d. per ton for the Commercial Company, and only 1s. 4·34d. per ton for the South Metropolitan Company? How is it that the South Metropolitan Company can get their carbonizing done for 2s. 7·25d. per ton, while it costs both the other London Companies hard on 3s. 5d. per ton for the same labour? Brentford, by the way, spends 3s. 4·36d. per ton on this score; which does not say much for the "sloper" influence, although it is 1d. less than the cost for the previous year. After what has recently been said, this figure will be carefully watched for the future. Bromley carbonizes the cheapest of all the Suburban Companies; the figure standing at only 2s. 7·07d. per ton, which is remarkable. Rates and taxes form another unequal item; the burden ranging from close upon 2s. 4d. down to less than 10¼d. per ton. There are some striking results to be dug out from the comparative table of workings for the past quinquennium; but these we must leave our interested readers to get for themselves.

The Report of the Massachusetts Gas Commission.

THE Tenth Annual Report of the Board of Gas and Electric Light Commissioners of the Commonwealth of Massachusetts has been issued; and it should be in the hands of all gas engineers interested in the many important questions of which it treats, in a way that leaves nothing whatever to be desired. The proceedings of the Commissioners constitute a highly instructive experiment in the regulation of gas and electricity supply undertakings under conditions that can truly be described as "racy of "the soil." The report states that there are now 129 undertakings under the supervision of the Board; 25 of these supply both gas and electric light, 46 supply only gas, and 58 only electric light. Ten towns in addition supply light. It is significant that there were no applications last year by Gas Companies for leave to embark upon electric lighting. It comes rather as a surprise, after all that has been stated by interested parties, that only 22 Gas Companies in Massachusetts supply water gas, either alone or in combination with coal gas. A specially interesting part of the report is that dealing with the subject of accidents. It is complained that many Gas Companies fail to report to the Board accidents in connection with their business, as required by law; and it is therefore recommended that a sufficient penalty should be enacted for this delinquency. As it is, from the information supplied, it is on record that during the year there were 32 deaths resulting from inhalation of illuminating gas. Of these cases, five were undoubtedly suicide, and six others had this appearance; the remainder being clearly accidental. There were two fatalities due to electricity. Besides the fatal cases, there were 21 accidents due to illuminating gas affecting 41 people; and four from electricity. The majority of the asphyxiation cases occurred in bedrooms; but several happened in offices and living-rooms. In one instance, 15 people had a narrow escape from death by gas in a Boston house—many of them being seriously affected. This was caused by a leak from a carelessly-made pipe-joint. All the fatalities and asphyxiations occurred in districts registered as supplied with water gas. This may be merely a coincidence; but it is an awkward one. Seeing, however, that some of the coal-gas companies confess to upwards of 33 per cent. of unaccounted-for gas, the only marvel is that they are not equally instrumental in effecting a reduction of the population.

The International Miners' Conference.

DURING the past week, an International Miners' Conference has been in session in Paris, at which the British coal miners have been largely represented. These gatherings are in a way of some use, although not precisely in the manner and to the purpose designed by their organizers. They are efficacious in showing the world something of the spirit that actuates the Trade Union leaders in regard to the industrial matters which principally occupy their attention; and the proceedings may even tend to enlighten some of them, who badly need the lesson, upon certain of the fundamental propositions of the science of political economy. In so far as the ostensible object of these international meetings is concerned, however—the consolidation of the interests of coal miners of all European nations into a common policy—they only serve to exhibit the irreconcilability of the views and projects of those who take part in them. Last Thursday's meeting of the congress was most instructive in this regard; for it was then that the sharp disagreement between the men of Durham and Northumberland with the delegates from other coal-fields, upon the question of the legislative limitation of the working day to eight hours, culminated in a division which left the former in a minority. However the voting may have gone, merely counting heads, the fact that the enormous trade of Durham and Northumberland coal was against the proposal renders it hopeless as a point of miners' practical politics. A striking speech against the Eight Hours Bill was delivered by Mr. Hugh Boyle, who had an amendment to move declaring that while a reduction of hours was desirable where compatible with the necessities of trade, this end could best be secured by arrangement between masters and men. This speaker even went so far as to declare that the interests of capital and labour are sometimes identical; for if trade is driven from a country, the workers suffer as well as the employers. Such a statement, made before such an audience as that—

composed, with hardly an exception, of arrant Collectivists—was a bold stroke dealt in the cause of common sense; but, of course, it failed. It is greatly to the credit of Mr. Boyle, however, to have made it. One of his English opponents acknowledged this, by expressing the greatest respect for the honesty and sincerity of the representatives of the Durham and Northumberland miners. Several wrangles occurred during the progress of the congress, mostly between the Englishmen and their Continental colleagues, and arising upon points of procedure. The habits of business and respect for rules made by themselves which characterize even English Trade Union leaders, appeared to be mere formalism in the eyes of the more mercurial foreigners; and consequently the proceedings were occasionally interrupted by bursts of turbulence seemingly out of all proportion to their causes. Still, on the whole, the congress was conducted in a more orderly fashion than any of its precursors, which is a testimony, to be commended to the notice of all Continental police authorities, to the value of these opportunities for "blowing "off steam." It is too much the habit of French and German policemen to act upon the contrary principle of "sitting on the safety-valve." If the workers who pay the cost of these gatherings think them worth the money, there does not appear to be any sufficient reason why they should not be held.

"Tempora Mutantur——"

In another column, we discuss in some detail one or two of the salient features of the Co-operative Congress held last week at Huddersfield. It is impossible to withhold sympathy from the objects of the promoters of this movement, which is so praiseworthy an attempt to realize in the sphere of industry and commerce the principle of "Live and let live," which everybody confesses to be a golden rule of social existence. So far as the process of distribution is concerned, co-operation can claim to have succeeded in the full measure of the hopes and expectations of its originators. This success is no small thing, inasmuch as it means far more than the gain of the superficial result of enabling the willing purchaser to obtain the fullest value of his money from a willing seller. Those of us whose memory reaches back to a period only twenty years past will remember how the irruption of the "stores" into the domain of the retail shopkeeper was the cause of a tremendous protest from the threatened interest, which went to the length of parliamentary agitation, and evoked impassioned complaints from the large class of the community, who declared that the new system of trading simply meant ruin for them. Computations were published showing that, for the London retail trade alone, the turnover of three or four of the new "stores" was tantamount to the whole of the dealings of all the shopkeepers of Oxford Street, on both sides of the way, from Holborn to the Marble Arch. It was asked, with much plausibility, how the poor shopkeepers could be expected to pay rent, rates, and taxes under the new conditions, when they had had as much as they could do to keep their doors open under the old. Well, there was no setting back the inevitable. The "stores" grew and prospered in their chosen fields of usefulness; and the grass has not yet grown in Oxford Street, nor do the Income-Tax Commissioners draw less than heretofore from this populous neighbourhood. The "bitter cry" of the shopkeeper against the "stores" has ceased; and the world with difficulty remembers having heard it.

Very much the same stage, with a difference, is now being entered upon by the organizers of production upon co-operative lines. Everywhere the prophets of the old dispensation cry out "Impossible," when some daring innovator proposes to help forward the solution of the problem of work and wages upon something like co-operative lines. It is the cry of the retail shopkeeper, with some variations. We have seen the beginnings of the new movement even in the gas industry—not usually reckoned among the most adventurous of British enterprises. But we are far from having seen the end. It is not for us, as interested bystanders, to say whether this or that is the only good road out of the slough into which production conducted according to the orthodox methods appears to have fallen; but we do claim the right to regard and discuss with an open mind the prospects of all honestly opened ways. The principle of "Live and let live" has not yet been exhausted by the process of joint-stock enterprise, even when governed by special protective legislation; and we are nowise inclined to post the forbidding notice "No Thoroughfare" at the entrance to every suggested new departure, at the dictation of those who find in their own particular circumstances good reason to "rest and be thankful." The time may come when producers will stand where distributors stand now, looking back at the agonies of the past as upon the horrors of a bad dream. "The old order changeth, giving place to "new;" and while it is the act of a fool or a madman to run after every new thing, merely because some other fool dubs it "Progress" or "Enlightenment," it is equally insensate to imagine that the clock will cease ticking out the hours at our bidding, or that the world which satisfies us will continue to satisfy those who will come after us. Times change; and it is the quality of wisdom to change with them, even at the expense of some little effort to make the necessary adjustment.

WATER AND SANITARY AFFAIRS.

The critical position in which the Hybrid Committee of the House of Commons left the question of the Transfer Bills relative to the London Water Companies, when adjourning for the Whitsuntide recess, justifies some remarks in addition to those we offered last week. The pivot on which everything turned was to be found in the instructions to be given to the Arbitrator. The Committee had clearly apprehended this point, and its importance must have been impressed on their minds with increasing force as Mr. Fletcher Moulton proceeded with his evidence, especially under cross-examination. As between the Companies and the County Council, the price to be paid for the undertakings is everything. If the "fair and reasonable" price were forthcoming, the Companies would sell, the Council could purchase, and there would be an end to all the struggle and worry. But anything like an agreed price is so remote a possibility, that arbitration appears inevitable. Even this would be a tolerable issue, were it to take the ordinary form. This, however, is not what the County Council intend; and the arbitration clause of the Transfer Bills transforms the process into "acquisition" of the most arbitrary character. All the weight is thrown into one scale, and the other kicks the beam. Mr. Moulton looks upon the directions given to the Arbitrator as indications of what is meant by the words in the Bill, "fair and reasonable "value of the undertaking." This view is doubtless correct. Mr. Moulton says he can understand that an Arbitrator, having nothing but these words to guide him, might interpret them in such a way as would "lead him "to fix a very different price to that at which the County "Council seeks to purchase the undertaking." Mr. Moulton can "imagine" this; and we presume he knows enough of the designs of the Council to render his imagination trustworthy. A non-natural sense is to be given to the words "fair and reasonable," in order that the Council may acquire the property on their own terms. Mr. Moulton considers it would be a "serious mistake" if the Arbitrator were to estimate the water undertakings according to their market value. Yet Mr. Costelloe, in a hostile article in the *Contemporary Review*, admits that if the market value were given, the bargain would be a good one for the ratepayer. Evidently this would not be good enough for the County Council; and the Companies are right in apprehending that the Council have no intention, if they can help it, of buying the undertakings at the price which they command in the open market. The Council intend to create a market of their own, in which they can purchase at their own valuation. The terms "fair and "reasonable," as employed in the Transfer Bills, undergo a perversion which makes them signify something neither reasonable nor fair.

Mr. Moulton's attempted analogy between the Water Companies and the Tramway Companies is altogether fallacious. The Water Companies are not limited to twenty-one years' duration, or any other period; and their shares have been subject to no misapprehension or ignorance such as may have occurred in the case of the tramways. As to any other "legal difficulties and complexi-"ties," there are none affecting the Water Companies, except such as the County Council are endeavouring to create, but which as yet do not exist. The market value

of the shares is founded on no error of ignorance or otherwise, except it be an unfounded faith in the security of an investment guaranteed by Acts of Parliament, and supposed to be secure against any attempt at compulsory purchase contrary to principles hitherto observed. It is now proposed to make a law for the Water Companies which, if applied to other commercial bodies, would very soon reduce joint-stock enterprise to a condition bordering on paralysis. That the Metropolitan Water Companies are to be made an exception to the rules of equity and justice is inconceivable, unless we are at the beginning of a new order of things, in which municipalization is to be elevated into legalized tyranny, empowered to ride roughshod over private rights. One noteworthy feature in the scheme by which the proprietorship of the water undertakings is to be revolutionized, consists in the extraordinary interval which is likely to elapse between the transfer of the property and the payment of the purchase money. There is a promise to the debenture-holders—whatever it may be worth—that they shall not be hurt; but what is to become of the other people, the holders of ordinary stock? Mr. Cripps says "it may be "eight or ten years before the sum to be paid for the "undertakings can be ascertained." We are at a loss to know what is to happen during this *interregnum*. Somebody may be ruined, for all we can tell; and the prospect seems full of the "chaos and confusion" which Mr. Cripps says already exists, and which the Council are certainly doing their best to bring about. The clause which provides that no contract made by a company after July 1, 1894, shall continue in force after the date of transfer, unless it shall have been made with the consent in writing of the Council, is apparently intended to prevent, or at least to embarrass, any extension of works authorized by Parliament since last July. The Council, so far as intention goes, have already placed their paw on the Companies; and the latter may not stir without their consent. Salaries and wages come under the same proviso, in regard to any grant or alteration. The "date of transfer," we may observe, is specified in the Bill as March 31, 1896, or any later date which may be agreed upon. An attempt at exceptional legislation appears to govern the whole tenor of these Transfer Bills.

The prolonged duration of the period likely to be absorbed by the arbitration process is a matter to which we adverted when the statutory notices of the Bills first appeared. Yet we confess to being startled when Mr. Cripps put the contingency into the concrete expression of "eight or ten years." Such a possibility marks the whole scheme as unreasonable, despite the complimentary phrase assigned to it. That the inquiry into value must necessarily take a very long time, appears by the evidence of Mr. Moulton, even apart from anything elicited under cross-examination. It is amusing to find this learned witness speaking of the ordinary shareholder as "not a "person of fully instructed mind." What is the real value of his shares, the Arbitrator is going to find out—on County Council principles. Mr. Pember put the case well when he said to Mr. Moulton that the Bill turned the Arbitrator into "a mere valuer." Mr. Moulton replied in the affirmative; saying that the Arbitrator ought not to act as a judge. It seems to us that, in this instance, the valuer has his business taught him by the Bill, and he is to make his estimate according to the rules laid down for him. On these and other points of a kindred nature the Committee are to be further enlightened by the arguments of Counsel, to be entered upon to-morrow.

Professor Ray Lankester, in delivering his fourth and final Lecture at the Royal Institution, on "Thirty Years' "Progress in Biological Science," is declared by the *Daily Chronicle* to have made "some astonishing statements." There is good authority for the maxim that "truth is "strange—stranger than fiction." Hence our contemporary stands amazed at facts with which he has not hitherto been acquainted. The element of the marvellous in Professor Lankester's address consists in the difference between chemical and bacterial conditions as affecting the quality of drinking water. Thus it is stated that the typhoid and cholera organisms will live in water which is chemically very pure. Even in distilled water, the typhoid bacterium will live for three or four weeks. But if this bacterium is placed in ordinary river water, it is quickly destroyed; the non-poisonous bacteria of rivers being active and vigorous organisms, expressly hostile to the typhoid bacteria. It is also proved by experiment that the ordinary putrefactive bacteria produce a poison which kills the typhoid organisms. Reasoning on facts like these, the inference seems to follow, as stated by Professor Lankester, that river water is healthier than that which is taken from a pure spring or lake, seeing that the latter is water in which the typhoid bacteria can flourish. Of course, it may be replied that the typhoid bacteria are not very likely to be found in spring water. At the same time, it is true that they are not calculated to live in water resembling that of the Thames, which is full of organisms hostile to the typhoid species. On the whole, the pathogenic germs enjoy only slight chances of survival, having little access to the springs, and being beset with enemies in the rivers. The *Daily Chronicle*, in seeking to discredit the water supply of London, takes what comfort it can from a report made by Mr. W. J. Dibdin, the Chemist to the County Council, whose voluminous account of the water of the River Thames has just been published. For a whole year, we are told, "the chemical detectives" of the Council have kept Father Thames under observation. The report is a very able one; but its practical significance really amounts to very little. The reader has to bear in mind that Mr. Dibdin has been testing the river chemically; and so far as the water supply is concerned, nothing is proved against that which reaches the consumer. Neither does the inquiry extend to that particular question; but blame is attributed to the Water Companies, as preventing the dilution of the Thames below Teddington, in proportion to the quantity of water they abstract higher up. We hold that this complaint is far-fetched; and we think Mr. Dibdin fails to do himself justice in respect to the enormous improvement which he has himself effected in the tidal portion of the Thames.

No one who is familiar with the attitude of most of the newspapers in regard to the Water Question will be surprised to learn that the Press has accorded flattering notice to Mr. Costelloe's recent fulmination. In particular, the *Pall Mall Gazette* has distinguished itself by endorsing the writer's extravagant attack on the Water Companies. "Water, Water Nowhere," is the *Pall Mall* head-line; the absurdity of which is quite in keeping with the leading article that follows. No one will deny, and every one—the Directors of the Water Companies included—regrets that very many water consumers had to endure inconvenience during the much-discussed frost of last winter. But it is quite another question whether that inconvenience constitutes a "legitimate grievance" against the Companies. The truth is that all the talk and bluster about niggardly treatment, slowness to effect repairs, extraordinary incompetence or indifference, extraordinary apathy, scandalous revelation, and so forth, is not, as the lawyers say, evidence. The *Pall Mall* may pile adjective upon adjective; but it proves nothing. Fault, if fault there were, should be fastened on the right shoulders. Sweeping and indiscriminate charges only serve to show that the writers of such diatribes have not taken the trouble to analyze their facts or to arrive at that judicial view of the *pros* and *cons* without which no verdict can command respect. From the "legitimate grievance" arising from frozen pipes our contemporary passes to an attitude of general condemnation. The water supply, we are flippantly informed, is a failure from the private householder's point of view "It is intermittent, it is inferior, it is extortionate; ". . . and Mr. Costello has no difficulty in showing "that our arrangements are wrong, not only in practice, "but in principle also." And why? Because, forsooth, water-rates are governed by the rateable value of the premises supplied. To quarrel with the Companies on this account is simply childish. The error, if error it be, rests with the Legislature. And what is the remedy suggested? According to the *Pall Mall*, "the conclusion "is that the system must be changed for one in which "the consumer shall have the power, through the municipality, of supplying himself." Perhaps it is scarcely necessary to point out the ridiculous fallacy that underlies this "conclusion." You may, as the *Pall Mall* says, change your tradesman and buy water from the municipality instead of getting it from a company. But what then? You will still have to pay for it according to the rateable principle; so that the system will not be changed at all. We do not hear of any intention on the part of the London County Council to alter the basis of payment. Our "municipal statesmen"—delightful and accurate

phrase!—are not going to sell water by meter to anybody and everybody who wants it; nor do they contemplate abandoning the advantages of the rating principle, which, as acted upon by the Companies, induces Mr. Costelloe and the *Pall Mall Gazette* to empty their vials of vituperation.

A curiously imperfect view of his rights seems to have lead a Mr. Daniel Smith into litigation with the Colne Valley Water Company, and induced him to claim the wrong remedy for his supposed grievance. Some time ago, he appears to have obtained a supply of water by meter from the works at present owned by the defendants. Then came the Special Act of the Company, which afforded a complete answer to the applicant's proceedings. The Company since their Act have supplied water pursuant to a statutory authority; and they can only be governed by what the statute contains. For the applicant, it was contended that the Company had taken over the burdens and obligations of their predecessors; but only in a limited sense could that argument be sustained. The question really was whether there was any contract between the Colne Valley Company and Mr. Smith to supply water by measure. Formerly the local supply was regulated by a Provisional Order. Now it was regulated by the Company's Special Act of Parliament. The Order and the Act could not be mixed up together for the purpose of perpetuating any special privilege or advantage which the applicant had formerly enjoyed. In the result, Justices Day and Wright declared that they found nothing in the case that afforded the least justification for the position contended for by the applicant. The writ of *mandamus* (upon which as a remedy, in the circumstances, the learned Judges threw grave doubts) was accordingly discharged. But apparently the applicant still failed to see the point; and, at the instance of his Counsel, he was allowed seven days in which to accept the judgment or carry his case further. Probably, however, he will end by coming to the conclusion that discretion is the better part of litigation.

Mr. G. Leveson-Gower, J.P., the Chairman of the Oxted and Limpsfield Gas and Water Companies, died, under painful circumstances, last Thursday week. The deceased gentleman, who was 57 years of age, had been suffering for a considerable period from recurrent melancholia; and this unhappily ended last week in his taking his own life, at his town residence in Gledhow Gardens, Kensington.

Mr. J. A. B. Williams, the Engineer of the Cardiff Corporation Water-Works, has given the Corporation notice of his desire to retire from the appointment of Engineer and Manager of the "old water-works and the distribution of water within the area of supply" on Sept. 29 next; but, if agreeable to the Corporation, he would prefer to retire on June 24. The Water Committee have expressed their regret at hearing of Mr. Williams's intention, and have recorded in their minutes their appreciation of his services.

Death of Mr. W. H. Wedgwood.—It is with regret that we have to chronicle this week the death, on the 1st inst., of Mr. W. H. Wedgwood, the Manager of the Ilkley Gas-Works, after only a few days' illness. Mr. Wedgwood, who was 62 years of age, had held his appointment for 36 years. He was a man of a quiet, unobtrusive disposition, and made many friends. In his younger days, he was an engineer in the Navy, and served as such during the Crimean War, as to which he had many interesting reminiscences. He was a Freemason, and a Past-Master of Olicana Lodge, by the brethren of which he was held in high esteem. On the gas undertaking passing from the Company into the hands of the Ilkley Local Board about two years ago, he was presented with a token of the shareholders' appreciation of his services.

Natural Gas at Wels (Upper Austria).—The *Neue Freie Presse* reports that the new deep borings in Wels are progressing satisfactorily, and are, as a rule, crowned with success. Lately a powerful gas spring has been encountered at a depth of 170 metres in a boring at Pernau. The associated manufacturers of agricultural machinery have made a very successful experiment with gas from a well 200 metres deep, by employing the considerable volume of gas obtained therefrom for the purposes of their works, whereby, as the lighting and heating properties of the gas are of a high order, a considerable saving has been effected. A lime-kiln is being constructed in the Eferderingerstrasse, in which natural gas will be used as the sole heating agent. The utilization of this gas for industrial purposes will contrast strikingly with the great waste which has taken place at the well on the Wolfsegg Thraunthaler Colliery since October, 1894. Here the gas might have been employed for lighting the carriages of the Austrian State Railways, in view of the proximity of the well to the railway station at Wels, and the facility thus afforded for filling the gasholders.

THE INCORPORATED GAS INSTITUTE.

PROCEEDINGS AT THE THIRTY-SECOND ANNUAL GENERAL MEETING,

HELD AT THE

QUEEN STREET HALL, EDINBURGH, JUNE 11, 12, & 13, 1895.

ROBERT MITCHELL, Esq., President.

INAUGURAL ADDRESS.

GENTLEMEN,—When you elected me your President, I was unfortunately unable to thank you in person; but, though delayed, my thanks are none the less sincere. In appointing me President of the Incorporated Gas Institute, you conferred upon me a very high honour indeed; and for that honour I now return you my grateful thanks. The discharge of the duties appertaining to the office has been a great pleasure to me; and now that my tenure of office is almost at its close, I would venture to hope that I have discharged those duties to your satisfaction. I have at least done my best to earn your approval; and in that endeavour I have had the hearty co-operation of every member of your Council.

After the words of welcome that have been addressed to you by the Lord Provost, I need say but one word by way of personal welcome to the capital of Scotland. I hope your visit will be beneficial, both intellectually and physically, and that you will be able, when you return to your respective spheres of labour, to qualify that old saying, "There's no place like home."

Though the Institute has been in existence for thirty-two years, this is only its second visit to Edinburgh. The first was in 1873, when the late Mr. Angus Croll was President. Without recalling the names of all those who have "gone before," it may be interesting to note how the Institute has progressed since that time. In 1873, there were 489 members of all classes. In 1888, the year preceding what we may call the "disruption"—seeing that we are in Scotland—the number of members was 823. At the end of last year, the number amounted to 583; and if all nominated at this meeting are elected, after allowing for the deceases and removals, the membership will be about 625. These figures, I think, prove two things—viz., that both the gas industry and The Gas Institute are flourishing. Many who were members in 1873 are, alas, no longer with us; but it must be a satisfaction to all to know that one gentleman who contributed a paper 22 years ago is to contribute another at this meeting. In 1873, Mr. William Sugg read a paper on "Standard Gas-Burners," and now he is to give us another on "Photometry as Applied to the Verification of the Illuminating Power of Gas Supplied to Towns." Another gentleman who contributed to our proceedings in 1873 was Dr. Stevenson Macadam; and although we have not the pleasure of his assistance to-day, we have in his son—Professor Ivison Macadam—a worthy representative. Both Dr. Macadam and Mr. Sugg were elected honorary members of the Institute on the occasion to which I refer.

But I must not longer dwell upon the events of a quarter of a century ago. We have a long programme to get through; and as it is not my desire that anyone who has prepared a paper for this meeting should be relegated to the obscurity of an appendix, I have no intention of occupying much of the time at our disposal. A presidential address is an *ex parte* statement, while a paper is subject to cross-examination; and, for that reason, I consider the paper the more valuable of the two. I shall therefore endeavour to make the *ex parte* statement as brief as possible, so that the authors of the papers and the cross-examiners may have plenty of time to discuss the various questions that are to be raised. I would very much regret if any prolixity on my part should be the cause of any one of the ten papers on the *agenda* being relegated to the "taken as read" class. When a gentleman has prepared a communication, the least we can do is to ensure him a hearing and a discussion; and if that discussion is severe, the author will be consoled by the reflection that the severer the criticism, the greater the benefit both to himself and to the gas industry.

I have touched briefly on a portion of the history of the Institute which is far remote; and I am sure you will bear

with me while I refer for a moment to events less distant and more sad. Since we last met, we have suffered a great loss by the death of one of our Past-Presidents, Mr. George Garnett. To him, the Institute owes a deep debt of gratitude—a debt which we can now repay only by keeping his memory ever green in our hearts. For those of us who worked along with Mr. Garnett in the cause of the Institute, his death means a personal loss, as it does to all who had the pleasure of his acquaintance. He was a man whose integrity was only equalled by his thoroughness and his benevolence. He thought evil of no man. What he said he meant; and what he did, he did with a whole-heartedness that recognized no obstacle. In Mr. Garnett, the Institute has lost a man whom the whole industry delighted to honour. Among others, we have also to mourn the loss of Mr. Thomas Hardick, who, I believe, was the oldest Gas Manager in the Kingdom. Mr. Garnett joined the Institute in 1864; and Mr. Hardick, two years later.

It is the uncomfortable duty of the President of an Association such as this to say something about the material and technical progress of the industry which we represent; but to mention anything that is new and fresh is becoming more and more difficult as the years roll on, and for two reasons. To adopt a well-known "bull," there is nothing new to say, and what there is has been said before. We cannot admit for a moment that our industry has arrived at the stagnation of perfection; but our progress towards perfection is at the slow rate which betokens a present very high efficiency. The advancement being made in the technics of gas manufacture and distribution is a progress not by "leaps and bounds" but by inches. Nevertheless, I venture to think that the advance is none the less sure. Still, it is impossible for one to select a single year, and say definitely that this or that advance was made in that particular year. In this country, we have a very expressive saying, so apt that it may not be unintelligible to my English auditors. It is that "every little maks a muckle." That, as I conceive it, is the position of the gas industry at the present day. A little improvement is made here and another there; and one day we waken up and find that a great achievement has been attained. The action is more of a silting than of a volcanic character. Take, for example, the developments in charging retorts. We had first the shovel; next the scoop; then the hand machine; and finally those beautiful appliances which have been the outcome of the genius of West, Foulis, and Arrol. But these changes were not brought about in a day or a year. The final achievement, if I may be permitted to use the term in connection with a subject that is ever progressing, was the outcome of accumulated experience and years of patient labour and study. To the younger members of our Institute, this should be a lesson and an encouragement. Young men are apt to think that, if they are not "setting the Thames on fire," they are doing nothing worth the doing. The sooner they get rid of that idea, the better for themselves and for the industry which, by and by, must be committed to their care. What is commonly called genius is frequently little more than luck. True genius consists of an infinite capacity for labour—labour that may appear plodding and fruitless at the moment, but which, if properly applied and directed, will inevitably bear sound fruit in the end, to the advantage both of the labourer and the cause in which he labours.

That there is a wide field to work in, there can be no doubt. Perhaps we do not always realize what a vast amount of capital and what an army of labourers are employed in the gas industry, in one way or another. We all know that the capital invested in "authorized" gas undertakings—undertakings belonging to companies and municipalities, and which are regulated by Special Acts of Parliament—is something like £68,000,000; and that the quantity of coal that these bodies annually carbonize is about 11,000,000 tons. But it must not be hastily assumed that this is a true measure of the extent of the industry. It is far from it. The "authorized" undertakings in Scotland number only 37. But the returns prepared annually by the Committee of the North British Association of Gas Managers show that the total number is 244. Similar figures are not available for the other divisions of the United Kingdom; but I believe that if they were, they would indicate a like disproportion. No doubt the undertakings that do not appear in the "authorized" returns are mostly small works. But, as I have said, "every little maks a muckle;" and all these little works go to swell the bulk of business done. If we take 12,000,000 tons as the quantity of coal annually carbonized in gas-works in this country, it will be a nearer approach to the actuality than is given by the "authorized" returns. In the actual work of carbonizing that quantity, there are employed between 55,000 and 60,000 men; and that is taking no account of the managerial and clerical staffs, and the army of men who find employment in the winning and transport of the coal, and in the treatment of the residuals that are produced in the gas-works. These few figures, which are of course simply estimates, may serve to give a more correct idea of the magnitude of the industry in which we are engaged. But over and above that, there is the capital and likewise labour employed by the numerous firms whose business it is to supply gas-works with the hundred-and-one things—from a bolt to a gasholder—that are necessary to the full equipment of the modern gas-works. The extent of that, we can only guess at.

Speaking of the quantity of coal used in gas-works reminds me that two processes of gas manufacture, having for their object the reduction of that quantity, have been engaging much attention during the past year. I refer to the water and oil gas processes; and it is matter for regret to me that not one of our members has seen his way clear to supply us on this occasion with a paper on either of these systems. I had hoped to be in a position to give you my own experience in the working of both methods; but, unfortunately, my Commissioners have not decided as yet to introduce either at the works under my charge. But I have had opportunities of inspecting the working of the Lowe water-gas plant, both in this country and in America; and what I have seen of it has led me to the conclusion that, sooner or latter, some such process will be adopted in most large works as an auxiliary, and that it will be a factor of no small importance in reducing the cost of production of the finished article. It has now been pretty clearly established that a 22 to 24 candle gas can, by this process, be delivered into the holder at a cost of between 1s. 1d. and 1s. 3d. per 1000 cubic feet—a price which will make it, in many cases, cheaper than coal gas of the same quality, with the further advantage that it offers a means of disposing of that surplus coke which so often cumbers the yards of many gas-works. In particularly referring to the Lowe process, I do not mean to suggest that the same advantages cannot be derived from other water gas patents. No doubt they can; but, having personally examined the Lowe process, I can speak of it with some degree of certainty. Hitherto it has not been considered advisable or economical to manufacture carburetted water gas in bulk. It has only been made in sufficient quantity to raise the illuminating power of the coal gas to the standard demanded by statutory authority or by usage. I am inclined to believe that this is its proper place—at the present time, at all events; and, if rumour be correct, the Board of Trade officials appear to be of the same opinion. But I cannot altogether agree with the reasons which are said to have led these gentlemen to that opinion. They seem to think that, if water gas is allowed to be supplied in quanity, the whole gas-consuming public will shortly be classed in the rental-book under the heading "Gone—no address."

While fully appreciating this concern for the collection of our accounts, I think a little too much is made of the carbonic oxide bogey. The opponents of water gas have made the most of the deaths from gas poisoning that are reported from America; but in this country we are not so much addicted to "blowing out the gas" as they are in the States. From the last report of the Gas Commissioners of the State of Massachusetts, we learn that in the year 1893-4 there were reported 32 fatal cases of gas poisoning. Of these, five were "undoubted cases of suicide," and six others had "the appearance of suicide;" leaving 21 as "clearly accidental." The remarks of the Commissioners on the cases returned as "accidental" are interesting. "Retired somewhat under the influence of liquor—probably blew out the gas;" "Gas was escaping through a 10-feet tip from a fixture on the wall over the bed;" "The gas was not in use, the room being lighted by electricity;" "Winifred, aged sixteen, had probably blown out the gas;" "Gas escaping from a broken pipe;" "Fixture partly opened—probably left so by accident;" "Possibly overcome by an epileptic fit before he could light the gas;" "Gas escaping from one of the burners;"

"The gas-jets were turned down;" "Gas-jets turned partly on;" and so on—most of the cases being due to taps being turned full or partly on. The returns as to the "makes" are not altogether complete; but apparently the year's make was about 4400 million cubic feet, and 2000 million cubic feet of that was water-gas, equal to about 46 per cent of the total. But we cannot attribute these 27 deaths to the presence of the 46 per cent. of water gas; for with coal gas the result would have been the same. Rather must they be laid to the account of individual carelessness and to the common use of bad taps—taps unprovided with a stop to limit their movements. If the fittings are sound, as they ought to be, there should be no more danger from carburetted water gas than there is from coal gas; and that, in the absence of culpable negligence, is *nil*.

My reason for believing that carburetted water gas will be used only as an auxiliary and enricher, is that market considerations are bound to come in, and so balance the cost of the two kinds of gas that neither can ever hope to have much of an advantage over the other.

In speaking of the safe supply of carburetted water gas, I took occasion to remark that the fittings must be sound. Unfortunately, these are beyond the control of the gas supplier. It has always been a cause for wonder to me that the present hap-hazard system of gas supply has prevailed so long. It is frequently said that we provide *light* and not *gas*. But it appears to me that, under the existing system, we do not get a fair chance to supply either the one or the other; for it frequently happens that when the pipes are ample to convey the gas, the burners are not capable of developing the light, and when the burners are capable, the pipes are not. Only recently a case came under my notice where a half-inch pipe was expected to supply one hundred burners! In these circumstances, the wonder is—not that there are complaints of "bad gas," but that those complaints are so few. Most water-supplying undertakings will not turn on the water to a house until they have satisfied themselves that the pipes and taps are in accordance with specifications; but the unfortunate gas supplier is compelled to send his gas, on application, into what to him is a *terra incognita*. If the pipes are properly proportioned, and the burners good, he gets credit for manufacturing good gas; while next door, where the conditions are reversed, he is charged with supplying air or, it may be, that the charge is that he refuses to supply anything.

In these days of portable photometers and amateur testing, surely it is not too much for the gas supplier, to ask that he should be assured of the gas he sends out being tested under something approaching proper conditions. As it is, we are held responsible for what we have no control over. I would not go so far as to say that pipes and burners should be at all times open to the inspection of the gas manufacturer; but what I do suggest is that, before the gas company can be compelled to give a supply, they ought to have the power to demand that the service-pipes and the burners are such as will enable the best use to be made of the commodity. In the absence of compulsory powers, much might be achieved if architects and gas-fitters would more frequently seek advice on these matters from the responsible officials of the gas companies. The distribution of gas is a special trade in itself; and those who make it their special study, ought to be consulted more freely than is at present the custom.

The system adopted in connection with the incandescent gas-light, or some modification of it, might with advantage be applied to gas-lighting generally. The Incandescent Gas-Light Company not only sell burners, but they undertake to fit them up, and to give them all the attention they require from time to time. It may be thought that, were the gas companies to do this, they would be overstepping the limits of their duties; but I am rather doubtful about that. We are *light*, not *gas* suppliers; and the pipe and the burner are parts of the apparatus required to produce luminosity. The incandescent system gives a very beautiful light, and one that has been highly appreciated, both in public and private lighting; but I venture to think that a part at least of its popularity may be traced to the scientific care which has been devoted to its practical application. "Anybody can fit up an ordinary burner" it is said; "but it wants a skilled man to fit up an incandescent burner." That is just where a great mistake is made. The ordinary burner has its laws, as well as the incandescent; and if these are not respected, disappointment is the result.

During your visit, you may have opportunities of contrasting the incandescent gas-burner and the electric light. The principal thoroughfares of the city are now lighted by arc lamps; and if you walk across to Nicolson Square, you will find an example of street-lighting by Welsbach lamps. Through the courtesy of Mr. Monkhouse, the Resident Engineer, the electric light station, which is considered to be *par excellence*, will be open for the inspection of the members on Thursday afternoon. The works have been in operation since the middle of April last; but they do not seem to have appreciably affected the consumption of gas. During the laying of the electric culverts, much inconvenience and trouble were experienced in connection with the gas mains and services; and several explosions occurred—happily unattended by serious consequences. Precautions have been taken to prevent further accidents; and at present I am engaged experimenting with a gas detector, with a view to making things absolutely safe. Meanwhile the plan has been adopted of plugging the ends of the conduit at each box, so that the area of possible danger is restricted—a system that has recently been recommended by the Board of Trade. To my mind, this is a great improvement upon conduits open from end to end, and with nothing in the way of ventilation beyond what accident provides. But possibly a still better plan would be that suggested by one of our members, Mr. Foulger, on the occasion of the official inquiry into the Cannon Street accident. You will remember that Mr. Foulger's proposal was that the electric light standard should be utilized as ventilating shafts. The lower half of the standard was to be packed in earth, to prevent firing-back from the arc; and a small ventilating pipe was to be carried from the culvert up through the standard to about half the height of the latter, where it would open to the atmosphere. The variations in level that are to be found in most cities would provide the necessary current; and the open ends of the ventilating pipes would be beyond the reach of mischievous boys and "safety" matches. But my experience of the electric light, as a neighbour, has been too short to enable me to speak with any authority upon this important subject. Perhaps its final settlement may be delayed till a gas director and an electric-light director are blown up together; but if that is to be so, I am sure every one of us will delay the settlement as long as we possibly can.

To-morrow we are promised a lecture from our esteemed friend Professor Lewes upon what may be justly entitled the novelty of the year—"acetylene gas." I shall not attempt to forecast what Professor Lewes has to say; for though he has spoken upon this subject about half-a-dozen times in as many months, he is such a rapid worker that he has always something new to lay before his audience. By his last deliverance upon acetylene, he put it out of the region of the gas manager's practice. It appears that acetylene is very fine by itself, but that it "sulks" when it gets into company. Why it conducts itself thus Professor Lewes will, no doubt, explain. At present the position appears to be that acetylene, with an intrinsic illuminating power of 240 candles—I beg Mr. Lewis T. Wright's pardon for using the word "intrinsic"—with a photometric value of 240 candles, has little more enriching effect than oil gas with a photometric value of 60 candles. As I have already said, I am unable to give you any personal experiences of oil gas; and it is difficult, from mere inquiry and inspection, to form a sound judgment as to the several processes now claiming the attention of the gas profession. The only method that I have at all studied is the "Peebles" process; and I am sure, apart altogether from our individual opinions of that plant, we heartily welcome its chief author to a place in our ranks. Regarding the system itself, the accounts given by those who have worked it are in every instance highly favourable. In its original form, it has done good work as an enricher; and a further development promises to bring it into the market as a bulk producer.

Both the chemical engineer and the mechanical engineer are working for the benefit of the industry. The former devises and perfects water and oil gas processes; and the latter gives us coal breaking, conveying, charging, and drawing machinery, as well as sloping and rotary retorts. Rotary retorts have not progressed beyond the experimental stage; but the merits of sloping

retorts and machinery for horizontal retorts may, I think, now be considered as proved. As to which is the better, I shall not venture an opinion at present. As yet, I have not personally experimented with either; but we are now engaged in putting in charging and drawing machinery of the Arrol-Foulis type at the works under my charge.

With regard to gasholders, which are important factors in the equipment of gas-works, each succeeding one appears to be bigger than its predecessor. In a very short time, we shall have in Scotland the largest holder in the world outside London. The economy of the large holder is beyond dispute; and there appears to be no reason why even the mammoth of the South Metropolitan Company should not yet be superseded. It will be perfectly evident to everyone that much greater saving can be effected by storing say 12 million cubic feet in a single holder than by using three or more separate holders for the same purpose.

But to put the gas into the holder is not the only duty of the present-day gas manager. He has also to take it out and sell it. We are to be favoured with a paper on "Distributing and Districting," so I shall not take up your time with that subject, though Edinburgh is a fine example of the necessity for districting. But to that I may have an opportunity of referring when Mr. Cross reads his paper. Beyond the distribution of gas through the mains, the manager of to-day has to attend to the provision for gas fires and cookers—a part of his duties to which he cannot devote too much attention. Here he has more scope for his energies than in the supply to burners; for when, as is generally the case, the fire or stove is let by the company or committee, he has some control over the service-pipe. The rapid development of this branch of our business must be a source of satisfaction to us all, as must also be the rapid displacement of the dangerous oil-lamp by the safe and convenient "penny-in-the-slot" gas-meter.

The legislation of the past year has been comparatively uneventful, as far as the gas industry is concerned. The South Metropolitan Gas Company promoted a Bill which attracted a good deal of attention—not on account of what it contained but on account of what it omitted. The Bill as it appeared before the House of Commons was simply one for the conversion of the nominal 10 per cent. stock of the Company into a nominal 5 per cent. stock—a proposal not by any means novel. Parliament has on several occasions recognized the principle; but in this instance the Committee reported that "they considered the subject was one of such far-reaching importance that the question of conversion of stocks ought to be dealt with by a Committee specially appointed to consider the same as affecting gas and water companies." As the conversion of the stock was the backbone of the Bill, the promoters declined to proceed further. When the Bill was first drafted, it contained clauses giving the Company's workmen-shareholders special privileges in the way of electing one of their number to the Board of Directors; but these clauses never came before Parliament, for reasons that are, no doubt, known to you all. That it was wise to withdraw them, I cannot doubt. It is almost impossible to imagine that matters would work smoothly with a man in the retort-house five days in the week, and in the board-room on the sixth. Mr. M'Crae has promised us a paper on the treatment and remuneration of workmen; and that will give you an opportunity to express your individual opinions upon this very important subject.

To those of us who do not believe that a low-quality gas is the panacea for all ills, the announcement recently made, that no Gas Bill would be allowed to pass with a less standard illuminating power than 15 candles, must have been very pleasing. The substance of the argument advanced in favour of a low illuminating power seems to be that, because the public do not know how to use a good thing, they should be supplied with a bad. But to my mind, it would be infinitely more reasonable were we to devote ourselves to educating our customers up to the use of the better article. That there is no immediate intention of reducing the standard illuminating power is indicated by the fact that the Committee on Standards of Light, after an inquiry extending over three years, has recommended that London gas be tested at a rate of consumption to give a light of 16 candles. The Committee also recommend that the standard candle be discontinued, and that the one-candle pentane air flame take its place—a proposal to which I do not suppose there will be any serious objection. Indeed, it is practically what this Institute recommended should be done.

In litigation, which is a near kinsman of legislation, I may mention the Gourock gasholder case, as the first that has come under the Burghs (Scotland) Gas Supply Amendment Act. In this case, it was sought to prevent the erection of a gasholder upon a certain site, on the ground that its presence would depreciate the value of the surrounding property; but, after a careful hearing, the Sheriff decided that the sanction of the neighbouring owners could be dispensed with. It is of little importance in itself; but it establishes a valuable precedent.

I am afraid I have already wearied you; but before I sit down I would beg to say just one word upon a subject which I consider of great concern to this Institute. Many of you will have noticed from the report of the Committee of Management of the Benevolent Fund that, during last year, the income has not been equal to the expenditure. May I venture to express the hope that this will prove an exceptional report? The Benevolent Fund does a great deal of good work in an unostentatious way; and it is deserving of the support of every member of the Institute.

In conclusion, gentlemen, I thank you for the patient hearing you have accorded to me whilst I have reviewed the various topics of interest at present occupying the minds of gas managers and others engaged in the profession. I will not detain you further, but proceed with the business before us.

Institution of Civil Engineers.—Among the premiums awarded for original communications submitted to the Institution during the past session was a Telford Medal to the representatives of the late Mr. Henry Gill, M.Inst.C.E., the Engineer of the Berlin Water-Works, for his paper on "The Filtration of the Müggel Lake Water Supply, Berlin."

The Belfast Coal Contract.—With reference to the further remarks of our Lancashire correspondent on the above subject last week, Mr. Stelfox states that "the repeated allegation is without the slightest foundation; no firm, large or small, having been even communicated with on the subject." He adds that, after his previous communication, he expected that only a correction would have been needed; but the way in which the matter has been put only makes things worse.

Thanks and Presentation to the Late Gas and Water Engineer of Rotherham.—By nine votes to six, the Rotherham Town Council last Wednesday passed a resolution thanking their late Gas and Water Engineer (Mr. C. B. Newton) for his services during the period he was in the employ of the Corporation. The Mayor (Alderman T. Woodhouse), in proposing the resolution, made a graceful reference to the hard work Mr. Newton had done for the borough, and particularly mentioned the great help given by him in the preparations for the Corporation Gas and Water Bill, and in the opposition to the Barnsley Water Bill, The members who opposed the resolution did so on the ground that they objected to thank people who had been paid for doing their duty; but it is pleasing to find that the majority have other views on the subject. On the following day, there was a farewell dinner and presentation to Mr. Newton at the Ship Hotel, Rotherham. The Mayor presided; and there were about ninety guests, including the Chairman of the Gas Committee (Mr. G. Gummer), the Town Clerk (Mr. H. H. Hickmott), the Secretary of the Gas Department (Mr. T. Bellamy), and the Gas Manager (Mr. M. Murdock). The presentation took the form of a beautifully illuminated and framed address, a massive silver candelabra centre-piece, and a silver-mounted oak liqueur cabinet. The address stated that the workmen in the Gas and Water Departments of the Corporation desired to place on record the esteem in which Mr. Newton was held by them, and the good feeling engendered towards him by his just and impartial dealings with them during the three years they had had the pleasure of working under his management. They asked his acceptance of the centre-piece and liqueur cabinet, which they trusted might in future times bring back some pleasant memories of his work in the district. They hoped that, in the carrying out of the important duties of his new office at Carlisle, he might meet with all the success they believed his professional training and past work so justly entitled him to. "The Health of Mr. Newton" was proposed by Mr. Gummer, who spoke in high terms of praise of the services Mr. Newton had rendered to the town both in the Gas and Water Departments. The presentations having been made by Mr. T. Searby and Mr. G. Newell, Mr. Newton (who on rising was heartily cheered) acknowledged the toast and gifts. He remarked that his early connection with Rotherham was not a bed of roses; and the gathering that evening, therefore, gave him great satisfaction. On behalf of himself and his wife, he thanked those present for their good wishes, and hoped the management would continue on successful lines, and have a prosperous future.

THE INCORPORATED INSTITUTION OF GAS ENGINEERS.

[Paper Read, May 9, 1895.]

THE MONIER SYSTEM OF CEMENT CONSTRUCTION AS APPLIED TO GAS-WORKS.

By F. D. Marshall, of Copenhagen.

The object of the author, in presenting this paper, is to introduce to his colleagues the so-called Monier system of cement construction, and especially as it may be applied to certain sections of a gas-works. He is under the impression that the system is little known in England, as inquiries have failed to find any literature dealing with the subject.* Some years since, a Company was formed to exploit the Monier patents in this country; but it is believed with but negative success. This is to be wondered at, considering the excellence of the idea, and the favour with which it has been received in France, Germany, and Denmark, and the uses to which it has been applied in those countries.

Generally speaking, the Monier system consists of a single or several layers of iron network, or iron rods crossed, of a thickness in accordance with the ultimate strain to which the structure is to be subjected, embedded in cement mortar, mixed in the proportion of one part of cement to three of sand. The iron network is, as a rule, constructed or woven on the spot where the building operations are being carried out. The thickness and number of the iron rods, the dimensions of the mesh, and the thickness of the surrounding cement, are determined for each application according to ascertained formulæ, for the perfection of which we are indebted to Herr Koenen, Government Inspector of Buildings in Berlin.

The Monier system is really the invention of a Frenchman—J. Monier, a Parisian gardener—who, in the course of constructing some large flower-pots or tubs, found that, by the insertion of a wire network in the cement, he could reduce by one-half the weight of the pots or tubs as compared with plain cement tubs, and could still retain the necessary strength. His next experiment was to construct a water-tank; and this with success. The French engineers soon became alive to the benefits of the plan; and at present there exist some thousands of water-tanks, and among them some gasholder tanks 60 feet in diameter, constructed on the Monier system.

It was, however, a German engineer—Herr Wayss, of Frankfort—who really perfected and popularized Monier's ideas, especially as far as their application to buildings was concerned; and, in conjunction with Herr Koenen, he adduced a true and reliable formula, according to which every description of construction to which the system is applicable may be worked out.

Referring to the accompanying diagram A [next page], and samples exhibited, it will be observed that the network consists of thick rods laid at right angles to the foundation of the structure. These are the tension-rods, and really do the whole of the work; whereas the upper cross rods are thinner, and are only used to keep the tension-rods in position, and distribute the strain upon them. The upper cross rods are, therefore, not taken into account in the calculation; neither does the connection between the rods exert any influence on the strength of the structure.

Assuming the rods necessary for a certain structure to be of considerable length, and not to be procured in one piece, it is only necessary to overlap the ends and bind them together with wire, and the cement covering will retain them in position in the future. The cohesive power between iron and cement is equal to from 40 to 47 kilos. per square centimetre—that is to say, if the ends of two pieces of iron 10 mm. thick are overlapped in a covering of cement, the strain necessary to separate them would amount to 2700 kilos., or 5400 lbs.

That the Monier system is a rational one, is evident from the fact that the iron network is embedded in the cement exactly at the point where *tension* in the *ironwork* and *compression* on the *cement* is exerted. Consequently, advantage is taken of the dominant qualities of the materials; and two varying substances, as iron and cement, are acted upon in such a manner as to cause them to work in harmony and mutually assist each other. The principle is so simple, and yet so effective, that it is a wonder that it has been so long neglected.

It is generally admitted that, under certain circumstances, concrete is preferable to brickwork, as far as strength and durability are concerned. Good concrete will bear a compressive strain of 170 kilos., or 340 lbs., per square metre; whereas the tensile strain it can bear is practically little greater than brickwork in cement, or about one-tenth of its power to resist compression.

If cement work in its simple form is to be constructed to resist tensile strains, it must be formed in a similar manner to iron castings, so that the section of the lower or under portion, which is in tension, must be in proportion to the upper or compressed portion in the same ratio as the resistance against crushing must be to the resistance against tension. It is, however, practically impossible to construct cement work in this manner. Consequently, another material is employed to assist the cement, in the form of the iron network—a material which is eminently fitted to resist tension, and furthermore endowed with the property of combining strongly and effectively with cement, and (what perhaps is a point of greater importance) to lose, when embedded in cement, the tendency to oxidize or rust.

To show how great is the effect of inserting the iron network, the following experiments may be quoted: Two cement blocks, or slabs, 1¾ inches thick, were constructed—one of ordinary cement, and the other with the addition of the network. These blocks were supported at either end; the supports being 1 metre, or 3 ft. 3 in. apart. The plain cement block broke with a load of 517 kilos., or 1034 lbs., per square metre of surface; whereas the second, or Monier block, bore a load of 2763 kilos., or 5526 lbs., without breaking, though the slab bent 13 mm. from the horizontal. A second experiment was carried out on another pair of blocks or slabs of similar size; the supports being 1·5 metres apart. The slab without the netting broke with a load of 660 kilos., or 1320 lbs., per square metre of surface; whereas the second, or Monier block, bore a load of 8000 kilos., or 16,000 lbs., *or twelve times as great*, before the cement covering gave way.

In Offenbach, in 1886, a system of Monier drain-pipes, 1·5 metres in diameter and 1000 metres long, were laid; and examination of the pipes recently undertaken showed them to be intact, and the internal network perfectly free from rust and decay.

Another and last example will show the enormous resisting power of the Monier cement arch. In Vienna, on May 17, 1890, an experiment was made on the arch of a bridge in connection with the Matzleindorfer Goods Railway. The arch in question had a span of 10 metres, or, about 32 feet, and was 15 centimetres (6 inches) thick at the crown. The embedded iron netting consisted of iron rods respectively 10 mm. and 7 mm. thick. The arch was subjected to a load of iron rails amounting to 100,000 kilos., or about 100 tons, on each square 20 metres of surface before the crown sank ½ inch. The weight was removed the following day, and the arch regained its previous form. Later, the same arch was loaded to the enormous extent of 19,720 kilos., or 39,440 lbs., per square metre. The foundations now began to give way; and although the arch was flattened, it was far from being ruined. Many other experiments of a similar nature could be quoted, but are omitted for want of space.

Objections have been raised from time to time. First, that the embedded ironwork will rust, and that consequently the enormous resisting power of the structure will disappear; secondly, that the cement will not attach itself effectively to the smooth iron; and, thirdly, that with variations of temperature the iron will expand and destroy the cement covering. During the ten years the system has been tried, it has been conclusively proved that not one of these objections holds good.

With respect to the first, it is now becoming the practice, at least on the Continent, to coat with a solution of cement ironwork that is ultimately to be embedded in brickwork, in preference to asphalting or painting, as it has been ascertained that rusty ironwork, after it has been embedded in cement for some time, loses its rusty surface, and becomes coated with cement; and it is the opinion of the writer that iron embedded in cement is practically

* The system was described in the Journal for Dec. 8, 1891, p. 1035; and references to it will be found in the numbers for June 14, 1892, p. 1118, June 26, 1894, p. 1230, and Aug. 7, 1894, p. 283.

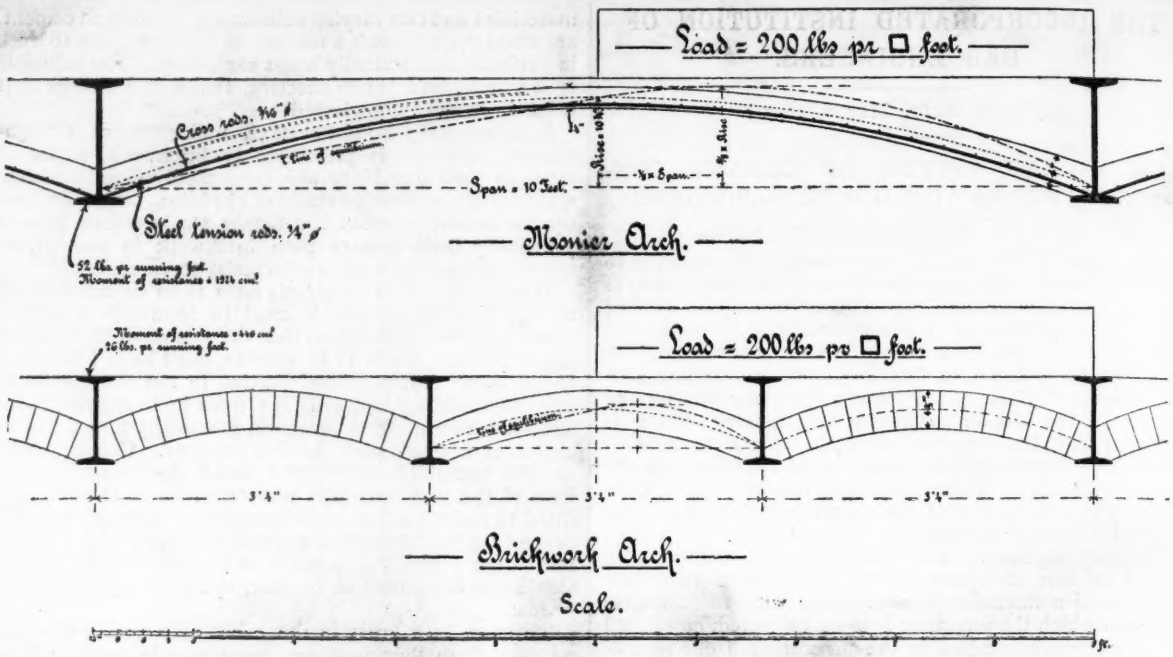


Diagram A, showing the Advantage of the Monier Arch as Compared with a Brickwork Arch.

indestructible, and that the cohesive affinity between the two materials is enormous, as many practical experiments have already proved.

Regarding the second objection, we have only to turn to the ascertained coefficients of expansion of iron and cement, and we find the former to be 0·0000145, and the latter 0·0000137 to 0·0000148,* or practically the same.

Having thus described the fundamental principles, of the Monier system, its advantages may be summed up as follows: (1) Great tensile resistance, with minimum of weight of materials employed. (1) Practical indestructibility. (3) Great saving in space. (4) Great saving in foundations, owing to the reduced weight of the superstructure.

Especia lly in the construction of floors and arches is this reduced weight of great importance, as, by the introduction of the Monier arch or floor plates, the weight of the girders and framework is reduced 50 per cent. The accompanying diagram shows the difference between the space occupied and the girders required for a Monier arch to bear a certain weight, and an arch of brickwork in cement to sustain a similar load.

The uses to which the Monier system may be applied are manifold and various—viz. to tanks, walls, floors, staircases, corridors, arches of all kinds, buttresses of bridges, breakwaters, tunnels, theatre galleries, &c. The immediate object of this paper, however, is to point out how this beautiful principle may be profitably applied to the construction of certain portions of gas-works.

The author has designed, and is now building entirely new gas-works, to replace the present works at Fredricksberg (Copenhagen), in which the Monier principle will be employed where possible—viz., in the arches supporting the floors of the manager's dwelling, offices, meter-making shop, station-meter room, engine, boiler, and condenser rooms, tar and ammonia tank, and the floor of the coal stores. The gain in space and reduction in weight are at once apparent by referring to diagram A. The tar and ammonia tank, and also the "pockets" or bins of the mechanically-worked coal-store will likewise be constructed entirely in Monier cement.

The tar and ammonia tank is shown on the accompanying diagram (B). The tank will be an excavated one—a parallelogram in form, 83 feet by 50 feet, and 10 feet deep—capable of containing 250,000 gallons; and it will cost complete £750, including the roof or covering. The sides are composed of a series of arches on edge. These are armoured internally on the Monier plan, and made a thickness of only 3 inches at their crowns or thinnest part, increasing to 5 inches where they spring from the upright rows of I-irons, the ends of which are embedded in the concrete foundation or floor of the tank. The covering is constructed of a series of Monier arches; the crowns being only 2½ inches thick. These arches are calculated to stand a load of 1000 kilos. per square metre, or equal to a double tier of full tar-barrels piled in two tiers over the whole covering of the tank. The arches spring from cross I-girders running transversely across the tank; and these in turn are supported by undressed fir poles, resting on rough granite blocks embedded in the concrete floor.

As the tank, during its construction and occasionally afterwards, will be empty, the extremely thin sides of the tank must be supported against the crushing-in weight of the surrounding earth—equal to 2828 kilos. per square metre; and for this purpose diagonal struts are placed at regular intervals along the walls. The struts consist of ordinary 4-inch cast pipes, *minus* their sockets; the upper ends spigoting into cast shoes attached to the I-irons, and the lower ends thrusting against short pieces of ⊔-iron embedded in the concrete. The component parts of the tank have been very carefully calculated; and the calculations are appended to the paper.

The exterior of the tank will be puddled with clay taken from the excavation, as it is not assumed that the thin cement walls will be water-tight, though they will be rendered so, when furnished, with a coating of hot asphalte and tar.

It is believed that the tank in question will be the largest yet constructed on the Monier system, and the first of its kind in a gas-works.

The next point of special interest connected with the new works is the mechanically-worked coal-store. The coals are received as required from the railway in regular quantities and at stated intervals, tipped into receiving hopper, elevated and distributed by a cotton band and "throw-off" arrangement into "pockets" or bins of the store. These pockets are four-sided inverted pyramids. The sides, however, are not flat, but each formed of an arch. The lower ends of the pockets are fitted with emptying regulators, worked by ratchet and pinion wheels, so that by adjusting the speed of their revolution, a larger or smaller quantity of coal may be ground out—no coal being able to pass until the regulators are in motion. From the regulators, the coal drops on to a lower conveyer cotton band, which carries the coal to the hoppers of the elevators, which in their turn elevate it to the overhead tanks in the retort-house, destined to feed the inclined retorts with which the house is fitted. The lower conveyor bands being in gear with the regulators, the speed of emptying and conveying is nicely adjusted. The coal-store, with pockets all filled, will contain something like 700 tons, or about a week's supply for the house as at present erected (about 1,250,000 cubic feet of gas per diem maximum).

* Bonniceau, *Annales des Ponts et Chaussées.*

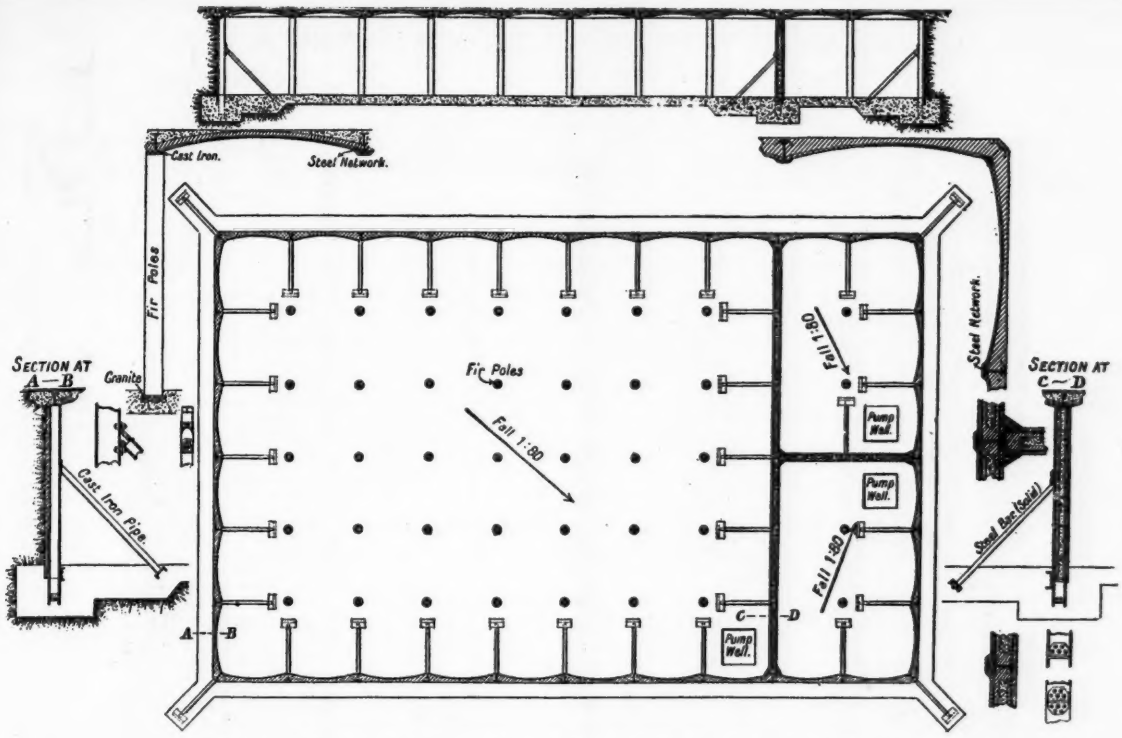


Diagram B.—Section and Ground Plan of Tar and Ammonia Tank.

All the machinery is worked from the engine-room; and it is believed that one man will be able to receive and empty the waggons, and fill the overhead coal-tanks in the retort-house, at the rate of 100 tons per day. The machinery and coal store will cost £3500; but, considering the enormous saving in labour, there can be no question that the outlay will be speedily recouped.

Such is the general design of the store as at present being erected. But the special point with which this paper is connected is the construction of the coal-bins or pockets. The weight of coal to be supported amounts to 3 tons per square foot; and to sustain this weight in the air in an economical and practical manner presented difficulties. Of course, the pockets could have rested on the ground, and a small tunnel been excavated underneath for the conveyor bands and machinery. But it was necessary that the openings of the pockets and regulators should be easily accessible; and it was deemed necessary to raise the bottom of the pockets above the ground. This involved very careful consideration, when the great weight of the superincumbent coal is taken into account. Brickwork and wooden framings were all duly considered, and abandoned because of their cost and cumbersomeness; and resource was at last had to the Monier system as a solution of the difficulty.

Diagrams C and D [pp. 1248-9] show that the Monier arches composing the bottoms of the pockets spring from ordinary concrete arch foundations, as they are only subject to compressive strain; whereas the pockets themselves are subjected to enormous tensile strain. The arches underneath the pockets form an excellent subway; and all parts of the machinery, bands, and regulators are easy of access. The sections of the Monier arches involved much calculation, as the pressure of the coal pyramids is very curiously and unequally distributed. No material, however, has been wasted in their construction.

The machinery is being constructed by West's Gas Improvement Company, of Manchester; and the coal-store itself, with the Monier pockets, by Herr Rothe, of Copenhagen. The author is indebted to his assistant, Herr J. A. Schmidt, for most valuable and valued assistance; and to Herr Emanuel Jensen, of Copenhagen, for such information as he has been able to gather concerning the experiments made in Vienna and other places. Especially is he indebted to the liberality and enterprise of the Chairman and Directors of the Danish Gas Company, who have afforded him every possible facility to perfect his ideas in the construction of what it is hoped will prove model gas-works.

[Appendix.]

CALCULATIONS FOR THE MONIER TAR AND AMMONIA TANK.

Calculation of Strength of Side Walls.

The Upright I*-Iron Supports.*—Constants: The load on the ground (surface) nearest the wall of the tank may be estimated at 1000 kilos. per square metre. The weight of 1 cubic metre of earth = 1900 kilos. The friction between the earth and the wall is estimated = 0. The natural angle of repose is estimated at 25°. On a 1 metre long portion of the wall is the resultant (E) of the earth pressure when the wall's height $= x$ metre.

$$E = \tfrac{1}{2} \times 1900 \times x^2 \times tg^2\left(45^\circ - \frac{25^\circ}{2}\right) = tg^2\left(45^\circ - \frac{25^\circ}{2}\right) = 0{\cdot}406.$$

$$\therefore E_1 = \tfrac{1}{2} \times 1900 \times x^2 \times 0{\cdot}406 = \tfrac{1}{2} \times 771{\cdot}4\, x^2.$$

The resultant of the load on a wall of height x and length 1 metre is—

$$E_2 = 1000\, x \,.\, tg^2 \cdot \left(45^\circ - \frac{25^\circ}{2}\right)$$

$$E_2 = 1000\, x \,.\, 0{\cdot}406 = 406\, x.$$

The whole pressure is therefore—

$$E + E_2 = \tfrac{1}{2}\, 771{\cdot}4\, x + 406\, x$$

The differential quotient gives the pressure per square metre at depth x.

$$\frac{d\,(E + E_2)}{dx} = 771{\cdot}4\, x + 406 \text{ kilos.}$$

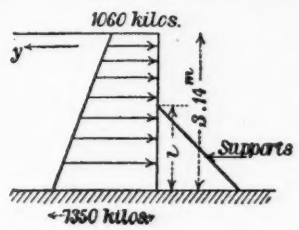
The pressure per square metre is reduced between the bottom and top as the ordinates to a straight line, whose equation is—

$$y = 771{\cdot}4\, x + 406$$

The height of the wall is 10 feet (Danish) = 3·14 metres. The *pressure at the foot of the wall* is therefore—

$$y\ 3{\cdot}14 = 771{\cdot}4 \cdot 3{\cdot}14 + 406 = 2828 \textit{ kilos per square metre.}$$

The space between the I-uprights is 2·6 metres. The pressure at the lowest portion of the joists is 2828 × 2·6 = 7350 kilos. per running metre. At the upper end of the joists the pressure will be 406 × 2·6 = 1060 kilos. per running metre. The pressure will therefore be distributed in this manner—



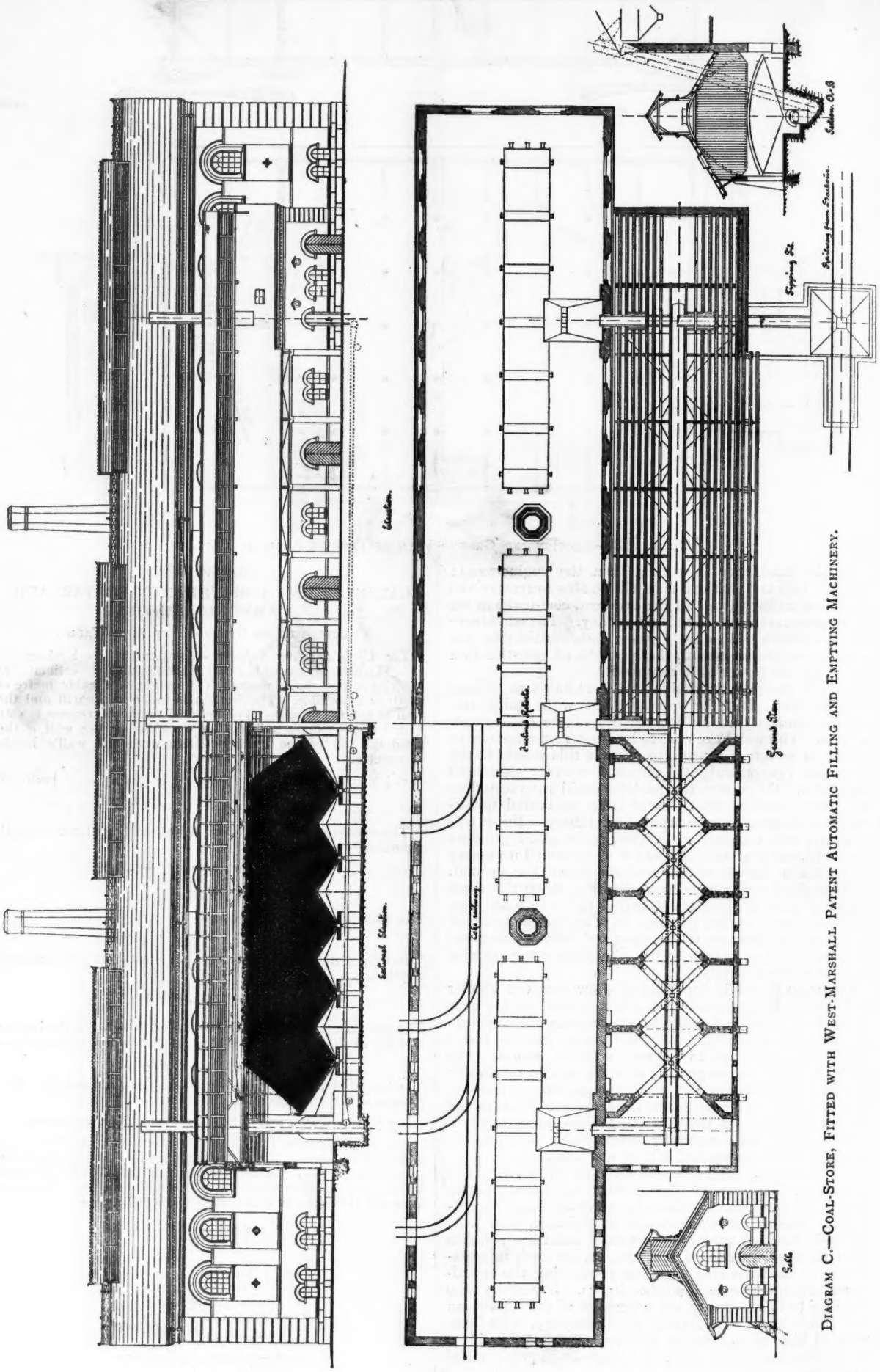


DIAGRAM C.—COAL-STORE, FITTED WITH WEST-MARSHALL PATENT AUTOMATIC FILLING AND EMPTYING MACHINERY.

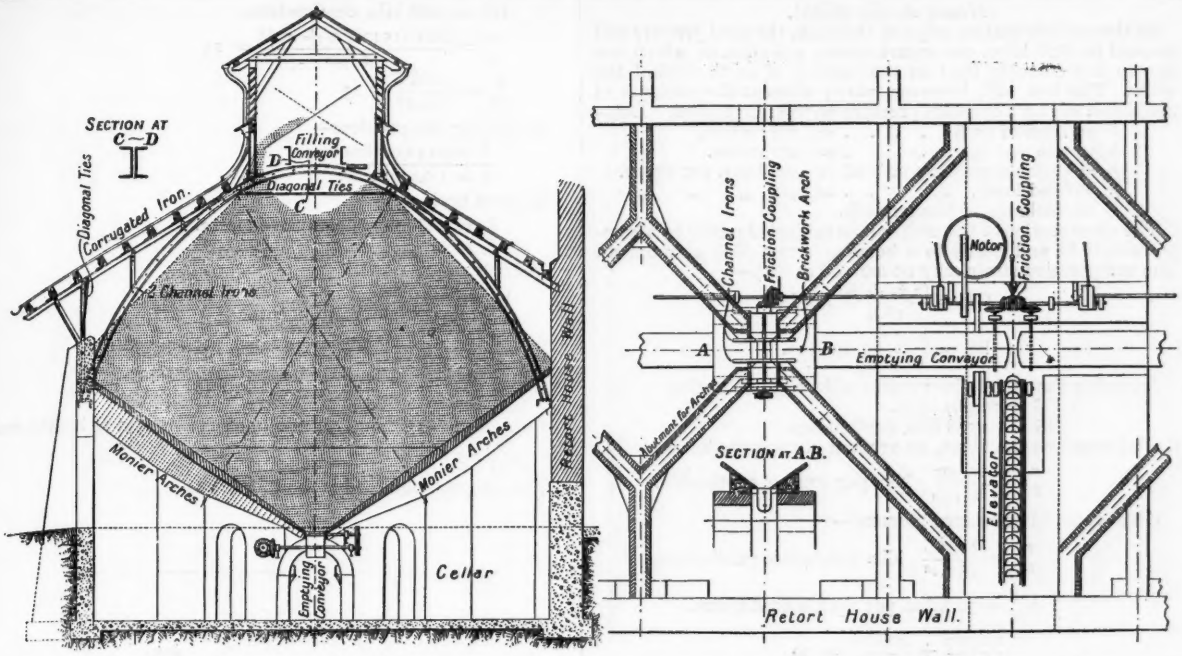
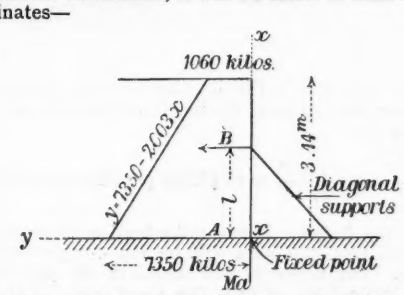


Diagram D.—Cross Section of Coal-Store; and Plan of Coal-Pockets, with Roof and Monier Arches Removed.

For a further calculation, it will be easier to alter the system of co-ordinates—



At the point x, the upright **I**-joists are embedded in concrete. The departure-point is fixed at x. The axis x is positive in the direction of the joist **I**.

The reaction and the moment at the fixed point is called A and Ma. The reaction of the supporting point of the strut is called B. First it is necessary to determine the most favourable point to fix the struts—viz., distance l. The greatest bending moments will be at the point of fixing and at the point of contact between the strut and the upright joist. The most favourable point of value of distance l will be that in which these bending moments will be equal. If this value be increased or decreased, so will the one moment grow and the other be lessened. The moment of load with reference to the departure-point is 15,562 kilogramme-metres. One has, therefore, the following equations :—

(1) $15{,}562 + Ma + B \cdot l = 0$
(2) $A + B + 13{,}204 \quad = 0$
(3) $Sa_x = B\,(l-x) + 15{,}562 - 13{,}204\,x + 3675\,x^2 \div 334\,x^3$

From equation (3) one can omit the fourth equation, referring to the line of elasticity and the differential equation. Equation (3)—

$$Sa_x = B\,(l-x) + 15{,}562 - 13{,}204\,x + 3675\,x^2 - 334\,x^3$$

becomes—

$$EI\,\frac{d^2y}{dx^2} = (Bl - x) + 15{,}562 \div 13{,}204\,x + 3675\,x - 334\,x^3$$

By integration, the equation becomes—

$$EI\,\frac{dy}{dx} = \div\,\frac{B(l-x)^2}{2} + 15{,}562 \div 6602\,x + 1225\,x^3 \div 83\,x^4 + C$$

The constant C is arrived at by $x = O \therefore \frac{dy}{dx} = O$

Substituting these values C is obtained $= \frac{Bl^2}{2}$

$\therefore$ The differential equation of the elastic line is—

$$EI\,\frac{dy}{dx} = \div\,\frac{B(l-x)^2}{2} + 15{,}562\,x \div 6602\,x^2 + 1225\,x^3 - 83\,x^4 + \frac{Bl^2}{2}$$

$\therefore$ With integration, the equation becomes—

$$EI = \frac{B(l-x)^3}{6} + 7781\,x^2 \div 2201\,x^3 + 307\,x^4 - 17\,x^5 + \frac{Bl^2}{2}x + C^2$$

The constant C is arrived at by that $x = O \therefore y = O$. By substituting these values, the following is obtained—

$$C^2 = \div\,\frac{Bl^3}{6}$$

The equation of the line of elasticity becomes—

$$EI \cdot y = \frac{B(l-x)^3}{6} + 7781\,x^2 \div 2201\,x^3 + 307\,x^4 - 17\,x^5 + \frac{Bl^2}{2}x \div \frac{Bl^3}{6}$$

As $x = l \therefore y = O$, the fourth equation becomes, by substitution—

$$(4)\quad \frac{Bl}{3} = 17\,l_3 - 307\,l^2 + 2201\,l - 7781$$

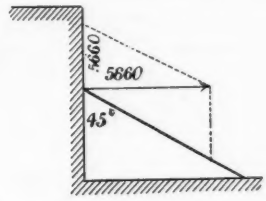
By the aid of equations (3) and (4), the most favourable value of l is arrived at thus :

(3) $Sa_x = B\,(l-x) + 15{,}562 \div 13{,}204\,x + 3675\,x - 334\,x^3$
$x = O$ gives the moment of the fixed point x
$Sa_o = Bl + 15{,}562$
$x = l$ gives the moments of the struts.
$Sa_l = 15{,}562 \div 13{,}204\,l + 3675\,l^2 \div 334\,l^3$
These moments should be equal.
$\therefore$ (5) $Bl = \div\,13{,}204\,l + 3675\,l^2 \div 334\,l^3$
By solving equations (4) and (5)—
$\therefore\ l = 1{\cdot}85$ metres and
$B = \div\,7544$ kilogrammes.

By substituting these values in the equations for Sa_o and Sa_l, also in equation (2), we find—

$Sa_o = 1605$ kilogramme-metres.
Sa_l, $85 = 1599$ " "
$A = \div\,5660$ kilos.

As the strut forms an angle with the side walls of 45°, the upright joists are subject to a *tension* of 5660 kilos., and the struts to a compressive force of 10,670 kilos.



For the upright joists, **I**-steel of No. 22 German normal profile has been selected, having a weight of 31 kilos. per running metre, a sectional area of 39·8 centimetres, and moment of resistance equal to 281 cubic centimetres. On account of the bolt-holes where the shoes are to be attached, the sectional area is reduced to 35 square centimetres, and the resistance moment to 233 cubic centimetres.

The influence on the fibres of the **I**-iron will consequently, on account of tension, be $5660 \div 35 =$ (about) 162 kilos. per square centimetre; and on account of resistant moment, $160{,}000 \div 233 =$ (about) 687 kilos. per square centimetre. The total influence on the fibre will be (about) 850 kilos. per square centimetre. As one of the conditions is that the material employed shall bear a breaking load of 3900 kilos. per square centimetre, it will have a safety margin of $3900 \div 850$, or about $4\frac{1}{2}$.

Monier Arches (Sides).

At the outside bottom edge of the tank, the *total pressure* will amount to 2828 kilos. per square metre, 406 kilos. of which are due to any movable load on the surface of earth behind the walls. The last will, however, vary; whereas the pressure of 2400 kilos. will be a constant pressure on the side arches. Let—

l = span of arch . . . . . = 2·6 metres.
h = rise „ „ . . . . . = 0·2 metre.
p_1 = variable pressure or load = 406 kilos. per sq. m.
p_2 = fixed load . . . . . = 2406 „ „ „
t = thickness of Monier arch.

The cross section of the arch will be subjected partly to a compressive (CS) and partly to a bending strain (BS) or moment. The compressive strain may be arrived at thus—

$$CS = \frac{(2p_2 + p_1)}{16h} l^2 \text{ kilos.}$$

$$BS = \frac{p_1 l^2}{64} \text{ kg. metres.}$$

Assuming the arch to be 1 metre wide, by substituting

CS = 10,997 kilos.
BS = 4,288 kilo. centimetres

the influence on the fibres, on account of compression, is—

$$\frac{r}{t} = \frac{10,997}{t.100} \text{ kilo. per square centimetre.}$$

On account of resistance moment—

$$\frac{r}{m} = \frac{4288·6}{100.t^2} \text{ kilo. per square centimetre.}$$

$$\frac{r}{t} + \frac{r}{m} = 30 \text{ kilos. per square centimetre.}$$

$$\frac{10,997}{t\,100} + \frac{4288·6}{100t^2} = 30$$

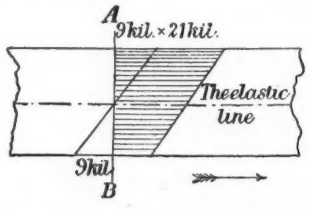
By solving the above, is obtained : t = 5288 centimetres = (about) 2 inches = *thickness of the arch at the crown.*

By substitution of t = 5288 in $\frac{r}{t}$ and $\frac{r}{m}$ is obtained

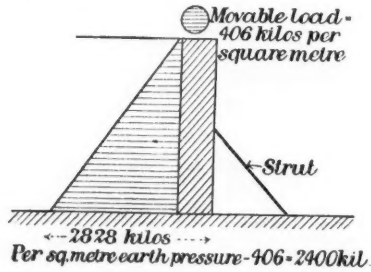
$$\left.\frac{r}{t}\right\} = 21 \text{ kilos.}$$

$$\left.\frac{r}{m}\right\} = 9 \text{ kilos.}$$

Graphically, the influences on the arch at its weakest point or section AB may be shown thus :



The compressive strains (CS) are set off in the direction of the arrow; and the tensile strains in the opposite direction. The shaded portion of the diagram shows the result of the compressive strains and moment influences. It will be observed that there is no tensile strain exerted on the arches at the *bottom* of the tank; and at this section they really require no wirework insertion. Higher, however, in the sides of the tank, the arches will be subjected to tensile strains, inasmuch as the bending moment is constant, as it depends upon the pressure exerted on the sides of the tank by the movable load on the surface of the ground, and not on the variation in height from the bottom of the tank.



Compressive strains in the arches will be lessened at every increase of height from the bottom. The height in the side walls, where tensile strains begin, are found as follows: It is clear from the above diagram that—

$$\frac{r}{t} = \frac{r}{m} = 15 \text{ kilos. per square centimetre.}$$

In the height, x is—

p_1 = 406 = movable load.
p_2 = 771·4 x = constant load.

By substituting—

$$CS = \frac{(2p_2 + p_1)}{16h} l_2 = 2·11\ (1542·8\ x + 406) \text{ kilos.}$$

BS = 4288 kilo. centimetres.

$$\frac{r}{t} = \frac{2·11\ (1542·8\ x + 406)}{t.100} = 15$$

$$\frac{r}{m} = \frac{4288·6}{100.t^2} = 15$$

By solving the problem—

t = 4·14 centimetres
x = 1·64 metres.

Highest up is—

p_1 = 406 kilos. per square metre.
p_2 = 0

This gives—

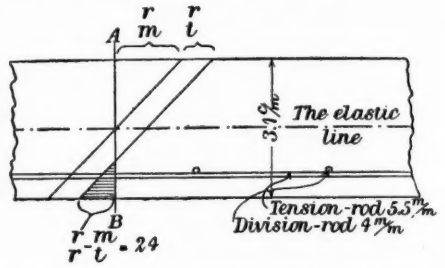
CS = 857 kilos.
BS = 4288 kilo. centimetres.

$$\frac{r}{t} = \frac{857}{t.100} \quad \frac{r}{t} + \frac{r}{m} = 30 \text{ kilos. per sq. cent.}$$

$$\frac{857}{t.100} + \frac{4288·6}{100.t_3} = 30$$

This gives t = (about) 3·1 centimetres = about 1¼ inches, and $\frac{r}{t}$ = 3, $\frac{r}{m}$ = 27.

The diagram obtained is therefore thus—

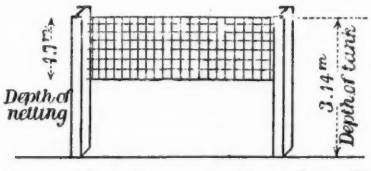


The shaded portion in the diagram gives the tensile strain for each running centimetre of the height of the arches.

The area is—

$$\frac{t\,(\frac{r}{m} - \frac{r}{t})^2}{4\ \frac{r}{m}} = \frac{3·1 \cdot 24^2}{27·4} = 16·5 \text{ kilos. per running centimetre.}$$

By placing the distance between the tension at 10 centimetres, the required sectional area will be 165 ÷ 790 = 0·22 square centimetre. The diameter will therefore be 5·5 millimetres. The rods to be fixed as near the lower edge of the arch as possible. For the division-rods, 4-millimetre round rods are selected, spaced 10 centimetres from each other. The iron network is continued to 1·7 metres from the upper edge of the tank. The margin of safety has been estimated at 10 for cement and 5 to 6 for the network.



ELEVATION OF TANK-SIDE BETWEEN I-IRON UPRIGHTS.

In reality, the arch is considerably stronger than is shown by these calculations—viz., 3 inches below and 2 inches above; and the Monier net will be continued in the tank quite down to the bottom, and divided in three portions. In the upper part of the network, the distance between the tension-rods has been fixed at 10 centimetres; in the second portion, at 15 centimetres; and in the lowest section, at 20 centimetres. The tension-rods are 6-millimetre round iron.

Calculations for Estimating the Strength and Dimensions of the Tank Covering.

Span of arches . . l = 2·6 metres.
Rise „ . . h = 0·2 metre.
Load (movable). . p = 1000 kilos. per sq. metre.
Weight of covering. p_2 = 400 kilos. per sq. metre (uniform load)
t = thickness.

The compressive strains may be computed thus—

$$CS - = \frac{(2p_2 + p_1)}{16h} l^2 = 3798 \text{ kilos.}$$

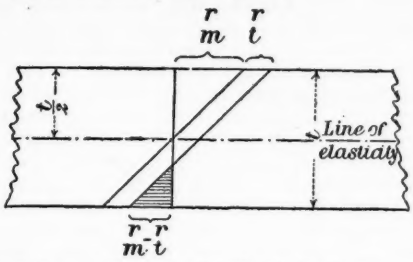
$$\text{Moments} = M = \frac{p_1 l^2}{64} \text{ kilo. metre} = 10,560 \text{ kilo. centimetre.}$$

$$\frac{r}{t} = \frac{3798}{100t} \quad \frac{r}{m} = \frac{10,560·6}{100.t^2}$$

$\frac{r}{t} + \frac{r}{m} = 30$ ∴ t = 5·27 centimetres.

∴ $\frac{r}{t}$ and $\frac{r}{m}$ gives $\frac{r}{t}$ 7 and $\frac{r}{m}$ = 23 kilos. per square centimetre.

The resulting diagram is consequently—



The shaded area shows the tensile strains in a running centimetre of the arch to be $\frac{t\left(\frac{r}{m}-\frac{r}{t}\right)^2.\ 10.}{4\ \frac{r}{m}}$

The sectional area of the tension-rods will be $\frac{t\left(\frac{r}{m}-\frac{r}{t}\right)^2.\ 10.}{4\ \frac{r}{m}\ .750.}$

Which, by substitution, gives 0·5 square centimetre as the sectional area of the tension-rods—viz., 8-millimetre round iron.

The arches are constructed 2½ inches thick at the crown, and 3½ inches thick where they spring from the I-irons. The tension-rods are of 9-millimetre round iron, spaced 10 centimetres from each other. The division-rods will be 4 millimetres thick, spaced 10 centimetres from each other.

Discussion.

The President said the hearty thanks of the members were due to Mr. Marshall for the pains he had taken, not only in the preparation of his paper, but of the diagrams which accompanied it, and which clearly explained what the Monier system was. They must also thank him for being good enough to come a long journey especially for the purpose of attending the meeting, and reading the paper.

Mr. C. Gandon (Lower Sydenham) said he understand Mr. Marshall to state that the chief object of the iron network was to resist tension; but in the diagram showing the arch, it appeared to him that where the network was placed it would be in compression. The same remark would apply to the vertical arches in the tar-tank. He hoped Mr. Marshall would not think he was trying to "pick holes" in the system; but, looking at the two arches shown on the diagram, he did not see where the very large economy of material came in. There might be a little saving in the brickwork; but the girders at the end in the concrete diagram were of much larger section than those of the brickwork one, though there were only two instead of four. He did not think there was any considerable saving there. He was a great advocate of concrete; and at his works there was a large tar-tank entirely composed of it, and covered with concrete arches. There was probably a good deal to be said in favour of putting some kind of ironwork into it. In the last retort-house built at Sydenham, they had the floor on iron girders with flat concrete flooring between. The concrete probably by itself would not hold; but old iron tubing, was bedded in it, and it answered perfectly well. He adopted it because there was not sufficient rise to form an arch. Therefore the floor was made perfectly flat; but he had no trouble with it at all. His concrete was made principally of seven parts of clinker to one part of cement; and it was therefore a great deal thicker than that referred to in the paper. It occurred to him, with regard to the coal receptacles, that if the thinest part of the side was only 2 or 2½ inches thick, the coal would soon wear the concrete away.

Mr. G. Livesey suggested that Mr. Gandon might give the meeting some information about concrete taking fire.

Mr. Gandon said he had thought of referring to that matter, though it was hardly pertinent to the paper. Last year they set two large boilers on concrete foundations about 10 feet high. The concrete was formed of furnace clinkers and cement; and on the top of the concrete, before the flues were formed, there were three layers of fire-brick bedded in fire-clay. To his astonishment, some weeks previous to the meeting, they found the whole mass of the foundations on fire. It had caught fire from the flues, and not only that, but the walls of the boiler-house, which were also built on similar concrete foundations, 9 or 10 feet high, had also caught fire; and he was sorry to say the fire was not then quite out, as they were putting water on it that morning.

Mr. A. C. M'Minn (Kensal Green) said he should prefer a little safer foundation for coal-stores; and he rather thought with Mr. Gandon that the constant friction of the coal in filling and emptying would, in time, wear away the concrete. Again, in the case of the heating of the coal, he feared the structure would be liable to damage by expansion and buckling.

Mr. G. E. Stevenson (Manchester) said this method of construction interested him very much, and it was highly ingenious; but he was disposed to think with Mr. Gandon that, in the arch shown in the drawing, the iron was not in the position one would expect in dealing with a case of tension. He would ask Mr. Marshall if, when he constructed these arches, he did not find that very great expansion of the concrete took place when it was setting, which would raise the arch, and buckle it up to a higher level than he would wish. He had found that concrete, made as strong as that described—viz., 3 to 1—had very great expansive properties, and might distort the work, and throw it out of truth, especially as, if the arches were thrown quickly one after the other, the action of expansion would propagate from one to the other, and there might be a tremendous thrust at the end unless the arches could rise. In the case illustrated, no doubt the expansion would result in the arches rising, because the crown was so thin. If, however, there were a heavy superstructure on the top, the pressure would be outward towards the end, and would cause the girders to bend, and, if there were an end wall, to thrust it out. The old system of building on brick arches, shown in the lower diagram, was certainly expensive and very heavy. Of late years, he had used corrugated steel troughing, instead of arches, for covering stage-floors, and so on; and he not only found it to be very strong, but easily put together, and very much less costly. He had adopted this for stage-floors in retort-houses. With regard to the tar-tank, the method of construction shown was evidently very economical; and if it proved durable, it might be advantageous. But he should prefer to put cast-iron columns instead of the fir posts. Probably they would not rot very easily; but he feared they would do so in time. The members might congratulate Mr. Marshall on being not only very ingenious, but very original; and they were obliged to him for explaining what he was doing, which was so different to the usual English practice.

Mr. J. W. Helps (Croydon) said he had listened with a great deal of interest to the paper, which was not only ingenious, but original. He thought the question of wear and tear would be an important one, and also the possibility of fire occurring in any of the coal-bins. It was true that, under the circumstances shown, they could be far more easily emptied from below than an ordinary coal-store; but there would be some difficulty arising, should any warping occur in the walls of the bins through fire. With regard to the principle of the store, it was very surprising to learn that Mr. Marshall expected that he would be able to get 100 tons of coal unloaded and dealt with by one man; but one could scarcely help thinking that the system was somewhat complicated, and would naturally expect the wear and tear in such a system to be rather excessive. Again, Mr. Marshall stated that the house in which the coal-stores were to be worked was intended for a make of about 1¼ million cubic feet per day. Now, he should imagine that in Copenhagen it was not easy to get regular supplies of coal; and the quantity provided for seemed rather a small one. He had a house in which they had retorts making about 1¼ millions per day. But there he had storage for some 3000 or 4000 tons of coal; and he found that it cost him about 2d. per ton to deliver the coal into the final elevator boot. With wages about the same as they were paying in England, Mr. Marshall's figures would work out something like ½d.; or, in other words, he would save in the year, on dealing with the coal, £160 or £180. Now, taking into consideration the fact that the whole apparatus would cost £3500, while the small overhead railway which he had in his house only cost £500, there was the interest on an extra £3000, which, at 5 per cent., was very near the whole saving in labour effected by this system.

Mr. W. R. Herring (Huddersfield) thought it was difficult to know why Mr. Marshall hit on this particular method of storing coal. It might be for want of comprehension; but he could not see any special advantage in it. It appeared to him that the chief object was to store coal in such a way as to remove it automatically to the

retort-house as required. Now, if the floor of the coal-store had been brought in one continuous slope from side to side (instead of in conical chambers) with suitable openings and arrangements in the side walls, for automatically feeding the conveyors, which could be made to run in a trench outside the building, far more storage accommodation would have been provided; and he did not see why it should not work equally as well as, if not better than, the method shown. It appeared to him that there was a great quantity of room lost in the coal-store; and, in many works in this country, room was of considerable importance. He should like to know if there were any other objects than those stated in adopting this particular form of store.

Mr. Frank Livesey thanked Mr. Marshall for bringing forward this subject, and expressed the hope that he would explain the question put by Mr. Gandon, as to how tension came into play in the upper arch, because he (Mr. Livesey) could not see anything in it but compression. Comparing it with the brick arch underneath, he supposed Mr. Marshall had taken the calculations of the inventors for the upper arch; whereas the bottom one very likely had been taken from some old formulæ on the strength of brick arches and iron girders. With reference to the tank made of concrete——

Mr. Marshall (interposing) said he was not dealing with concrete at all. It was cement mortar. There was no rubble or broken brick whatever in the cement.

Mr. Livesey said he understood it was 1 part cement to 3 parts of sand. If a concrete wall were built at the side of the tank instead of a cement arch, 1 part of cement and 10 parts of ballast, it would be a thicker wall, but it would not want any girders or struts. He could not say at the moment whether or not it would be cheaper; but it seemed to him that it would be stronger. Where this construction came in profitably must be where it was brought into tension. If the upper arch had been a flat slab, and the network were introduced, undoubtedly it would have been much stronger than a flat slab of cement alone. He supposed Mr. Marshall was in a neighbourhood where wood was easy to obtain, and cheap; and he could certainly state that wood in a tar or liquor tank would be as sound at the end of ten years as when it was put in—probably a little better. At any rate, he supposed the decay of wood took place either from vegetable or animal growth; and as neither of these existed in a tar-well, it must be a preservative—the creosoting of timber had the same object in view. Still, a cast-iron column would be equally unaffected. With reference to the tank, he thought some precaution would be necessary. Concrete or cement did not set very quickly; and if ammonia were put into the tank before the cement was thoroughly set, it would destroy it. Consequently, a certain amount of time must be allowed before any tar or liquor was put into the tank.

Mr. J. Tysoe (East Greenwich) asked if such a large body of coal being placed in the receptacles would not exert an outward thrust on the walls of the stores. He said it seemed to him, from the shape of the arches, that a much larger proportion of the weight would be transferred to the side walls than if the coal rested on a horizontal bottom. He had himself had some trouble from the same cause; and it had occurred to him that the walls were hardly strong enough, and it might be desirable to put in some cross-ties.

Mr. Marshall, in reply, said the appendix to his paper would be found to contain the mathematical formulæ employed in the construction of these arches. If desired, he could go through it then; but he should prefer the members studying it at their leisure. He could only assure them that in the arch where the wirework was inserted there was absolutely no compression—it was below the neutral axis of the arch. When members had studied the details in print, he should be quite prepared to discuss the matter in the columns of the technical press, if neecssary. This was not a theory. He did not claim any originality. The Monier system was ten years old, and the patent had run out; and it was surprising to him that it had been so long neglected in England. He had anticipated many of the remarks which had been made, and had taken elaborate pains to show in the diagram that where the ironwork was inserted was the place where the arch had lost all compressive power, and the tensile strain on it began. But it was very difficult to explain it without the formulæ. He had only adopted the Monier system after long consideration, and after visiting Berlin and Vienna, and other places, where it had been employed for some years. It seemed so practical, and was so well spoken of in every direction by German and French engineers, that he saw no reason why he should not adopt it. The more he worked out the system, the more beautiful and more advantageous it appeared. He could assure Mr. Tysoe that, with regard to the form of the coal-hopper, there was no thrust at all on the side of the retort-house, as he could prove mathematically. There might be a little thrust on the arch itself; but the coal was giving absolutely no thrust on the side walls, or only doing so to a very nominal extent, and the coal-house itself was of sufficient thickness to bear the strain. Four or five times the coefficient of safety was given to every portion of the structure. They had worked on this for about three months; and every single point in the construction of the new works had been carefully worked out before starting. This was not the occasion on which to give a description of the new works, as he hoped to do it some other time, when he would put in all the formulæ showing the strengths and thrusts, and furnish every possible information. The coal in the hoppers was placed so as to be at the angle of repose. It was not resting on the retort-house wall or on the upper edge of the arch; the whole weight rested on the Monier arches. The weight was equal to 3 tons on the square foot; and the arches were constructed to bear four times this weight. Each pocket was self-contained and independent. It had no relation constructively to the next one. With regard to danger from fire, it was a curious thing that all the insurance companies abroad would accept a lower premium for houses built on the Monier system, because one great advantage of it was that it was absolutely fireproof. Cement would catch fire, he believed, under certain circumstances. But here there was practically no heat; and they would be walking under the coal-stores continually, and could feel with the hand whether or not any heating was taking place, and in the course of a few minutes could empty the bins. It was not like having a great mass of coal which one had to dig into. Any danger could be immediately localized. As regarded the friction on the cement, it was practically *nil*. Of course, there would be the sliding of the coal over it. But it would be a very slow process; and if any wear and tear appeared, it would be easy to put one out of action for a short time, and give it a rendering of cement. There was no fear of the wirework giving way; and the cement might easily have another coat, or one could put the very lightest steel plates inside. But, from his experience of cement construction, the wear and tear which good cement would stand was enormous. He was not speaking of concrete, but strong cement mortar. With reference to Mr. Frank Livesey's remarks about ammonia attacking cement, he might say that last year he built a large tank at Elsinore, and, not having any fresh water, he thought the only thing to do was to use weak liquor; and he found it made a most excellent concrete—showing that ammonia water being mixed with cement had not the slightest bad effect. One could make concrete with weak ammoniacal liquor just as well as with water. Of course, they would not, under any consideration, bring the tank into use until it had stood for two months. It was of the very greatest importance that it should have time to thoroughly set—not only that the pores should be filled up, but that it should reach its full strength before being used. Then the surface inside could be coated with hot tar and asphalte, because the cement itself was almost porous, and otherwise the water would squeeze through the sides. The corrugated construction was largely used in Germany. He had seen large workshops of corrugated iron run in with cement. It was a cheap method of construction, and he could recommend it as one of the best materials for retort-stages. In designing the new gas-works, they hunted up every system they knew of, and obtained tenders for every portion of the works on the different methods—corrugated floors, brick floors, and Monier floors; and they obtained alternative tenders for each section. In every case it turned out that the Monier system was 15 to 20 per cent. cheaper than any other. The same remark applied to the arch. Mr. Frank Livesey had suggested that the arches had been drawn from some antiquated formulæ out of old books; but this was not so. The whole thing was evolved scientifically in the office. It was an arch constructed experimentally

and theoretically to bear the weight required upon it; and nothing was taken for granted. He had drawn attention in the paper to the question of expansion. There was practically no expansion in these arches. They had no weight to bear, but were simply floors; but they would certainly not run any risk of making floors if there were any chance of buckling. In Berlin and Vienna, he had seen large warehouses with beautifully laid floors, and not the slightest sign of the arches rising. The coefficient of expansion of iron and cement was about the same. Of course, the longitudinal girders had a certain amount of play allowed them; but with regard to the structure of the arch, there was not the slightest fear of its rising. This could only be done by the joists squeezing in and lifting the arch. The side walls were of sufficient initial strength to stand straight; but the end ones had a certain amount of play.

Mr. G. E. STEVENSON asked if the whole of the arches were filled up at once, when building, without any delay.

Mr. MARSHALL replied that they first set the two girders, then built underneath that a wooden platform; then above that they put the network a proper distance from the lower surface and the upper surface. When this was built, it was supported with small wooden pegs, and the cement was then run in. These pegs could be removed; but if they remained in, it made no difference. All one had to do was to put the ironwork together, run in the cement, and make all smooth; and the work was practically finished. With regard to the quantity of coal provided for, he should say that this was not their coal-store. They had at the harbour a store from which a supply was obtained daily. What was shown on the diagram was simply the means of transferring the coal to the retort-house. If they shot this coal on to the ground, they would have to employ a man to wheel or push it, or have supplementary hoppers to take it up to the coal-house. They had tried the suggestion of a sloping floor; but it was found that the expense in the material employed to support the sloping floor would be from 25 to 30 per cent. more than building pockets in the manner described. With regard to the cost, he was not situated as members were in England; and it was found that the saving in labour would more than compensate for the interest on the outlay. Instead of having to provide 5 per cent. on the capital, in the course of four years they would have almost paid for the installation. It was exceedingly simple. The coal came in and was tipped, or rather tipped itself by the action of gravity. The man had nothing to do. The machinery was put in motion by one man; and the whole thing was absolutely automatic. He could only say, in conclusion, that if anyone desired further information, and would write to him, he would be pleased to furnish it; and any of his drawings would be at their service.

Narrow-Gauge Engines for Gas-Works.—The current number of *Engineering* contains an illustrated description of a narrow-gauge tank engine recently constructed for the Nine Elms station of The Gaslight and Coke Company. It was built by Messrs. W. G. Bagnall and Co., Limited, of Stafford, to run on one of their 2-feet gauge railways. The cylinders are 5 inches in diameter with 18-inch stoke; and the wheels are 14 inches in diameter. The boiler is of steel, with copper fire-box, and brass tubes 1¼ inches in diameter. Its fuel capacity is 5½ cubic feet; and its water capacity, 60 gallons. All the working parts are easily accessible; the cylinders and valve-gear being outside the frames.

Petroleum in Lower Alsace.—At the recent meeting of the Federated Institution of Mining Engineers, Mr. L. van Werveke gave an account of the petroleum district of Lower Alsace. Petroleum has been proved to exist by borings at various levels to a depth of upwards of 1000 feet. The winning of petroleum is an industry of great antiquity, and was referred to as ancient by a writer in the fifteenth century. It used to be carried on by mining; but it is now worked by borings in the usual manner. The production of crude oil in Lower Alsace last year was 15,632 metric tons; the refined petroleum produced amounting to 4000 metric tons a year, or 1½ per cent. of the consumption in Germany. The author quoted the different opinions expressed by various authorities regarding the origin of petroleum, and adduced evidence in support of the view, that the original petroleum-bearing stratum belongs to the tertiary period, for both in Upper and Lower Alsace the oil occurs at a particular horizon; that it was a lagoon and delta formation; and that with the decomposing plants, which have yielded the brown coals as well as bitumen and oil, were mingled animal remains from which the nitrogen in the oil is derived.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1268.)

THE expected revival of enterprise and speculation in the Stock Exchange is at least deferred; for it gave no sign whatever of making its appearance last week. Indeed, things were very quiet and dull; and the markets seemed scarcely to have thoroughly awakened from their holiday torpor. Apart from the downward tendency in the mining department, which exercises much influence nowadays, foreign affairs were not too cheerful. It is in the last degree improbable that any serious mischief will come out of the hitch in the proceedings at Constantinople—it would set all Europe ablaze; but still it is disquieting. Meanwhile, however, Consols and all gilt-edged securities are higher, as money keeps steadily pouring into them. The slackness of the Money Market aids this movement; the difficulty of employing it to any advantage being very great. Business in the Gas Market was below the average; and, but for dealings in the two biggest issues, would have been very quiet indeed. The general tendency continues to be in favour of higher prices; and several quotations have advanced. The only move the other way was in Imperial Continental; but it is probably only the result of realizations of profits after the recent considerable rise. In Gaslights, the "A" was very brisk at an advance of one point on the previous week's closing quotation; and it maintained its position to the end. Some of the secured issues changed hands at high figures; and an increase in the price of "J" and "K" could no longer be resisted. Business in South Metropolitans was rather quiet; but all bargains marked showed good prices. Nothing at all was recorded in Commercials. The Suburban and Provincial division was almost untouched; but the quotation of Crystal Palace was advanced a couple of points. Business in the Continentals was confined to Imperial, which touched 250, but then fell back, and could do no better than 248¼. None of the rest presented any feature calling for remark. Among the Water Companies, there was some indication of a more hopeful feeling with regard to the fate of the London County Council Bills; and some quotations advanced. There was a slight retrograde movement in Grand Junction and Southwark, owing to the announcement that their next dividends will have to suffer a considerable diminution.

The daily operations were: The Gas Market was tolerably active on Tuesday, the day of reopening; and prices for everything dealt in were at high figures. Gaslight "A" rose 1; and ditto "J," 2. In Water, East London recovered 2; and West Middlesex, 1; but Grand Junction receded 1. Gas was much quieter on Wednesday; but prices generally remained about the same, except for a fall of 2 in Imperial Continental. Chelsea Water rose 3; but Southwark fell 2. There was more activity on Thursday; and Gaslight "K" advanced 2. On Friday there were many dealings in Gaslight "A" and Imperial Continental; but little else was touched. Crystal Palace rose 2. Grand Junction recovered 1. Saturday's business was unimportant; and quotations remained unchanged.

ELECTRIC LIGHTING MEMORANDA.

Installation Work at Leicester and Elsewhere—Wiring Work by Electrical Supply Companies—Electricians on the Dibdin Standard—New Board of Trade Regulations.

WHEN we recently commented upon the electrical wiring question at Leicester, it was not with the slightest intention of falling foul of our esteemed contemporary the *Electrical Review*, from which we are accustomed to obtain a good deal of very welcome information respecting the state of the industries which it so efficiently represents. We were only concerned to show that in undertaking installation work in competition with private firms, the Leicester Corporation are carrying into their new field of activity the practice which has always prevailed in the Gas Department, greatly to the advantage of the townspeople; and we were able to quote something from our contemporary's own columns to prove that wiring, as frequently done by private contractors, furnishes ample reason why Leicester householders requiring such work should elect to put themselves into the hands of the Local Authority, who have every inducement to serve them faithfully. Strange to say, our observations in this regard have displeased our contemporary, which declares it must "protest most strongly," against some of them. When the ground of this protest is looked for, however, it appears to rest wholly upon our assertion that, in seeking to make the profits upon installation work help to reduce the present loss upon the supply of current, the Leicester Corporation are only doing what electric lighting undertakings have done all the world over. This statement is declared to be "contrary to fact," so far as this country is concerned; and we are challenged to publish a list of companies and corporations which, besides supplying electrical energy, undertake wiring work. No notice is taken of the quality of the work done by competing contractors.

This is not an electrical directory, and we are, of course, unable to compile any such list as that now demanded; but it is matter of common knowledge that, at any rate, very many of the provincial electric lighting companies began their career

and helped their revenue accounts by their installation work. Nor has the practice been confined to the provinces. In the same issue of the *Electrical Review* which accuses us of misrepresenting the facts in this regard, there appears a strongly-worded complaint from "a correspondent who carries on the business of an electric light engineer and contractor, not a thousand miles from the West-end of London," against an electric supply company, for taking a wiring contract out of his hands at the instant he fondly thought he had secured it. Our contemporary remarks that, if we really desire "to pose as an authority on electrical matters, a systematic reading of the electrical journals is imperative." It would appear that the advice might be taken to heart by those who offer it. The ire of the *Electrical Review* over this small matter arises, of course, from the consciousness that we have touched a sore place in pointing out that electric lighting speculators are glad to get installation work, and sorry when the generating station is left to earn its own living without such adventitious assistance. Says our critic upon this head: "If there is one thing that we and our electrical contemporaries have endeavoured to show, it is that an electric lighting supply can be conducted with profit without any help from extraneous work." Just so. This has been shown—in print—over and over again. The time has now come for the stations themselves to show it by their revenue accounts; and very few and choice are those that can do it.

It is satisfactory to learn from the *Electrician* that the electric lighting interest has no fault to find with the recommendations of the Standards of Light Committee, but is prepared to accept the conclusion that the Dibdin 10-candle standard is "the best solution at present possible of this much-discussed problem." Though they were not directly considered in this connection, the good opinion of electricians will help to establish the proposed standard in the favour of the authorities and the public. Naturally, they would have liked an electrical standard, had such a device been possible; but it is frankly admitted that there is no such appliance at present available, while the conclusions of the Committee are acknowledged to be in the direction to which general practice has been tending for some years past. It is well known that the practical photometry of incandescent electric lamps has been conducted all along by the aid of the Methven standard, which will still continue to be used in working electrical and gas laboratories. The scientific world has had enough of so-called scientific standards of light, which are neither standard nor scientific; and though it is to be expected and desired that there should be increasing effort in the direction of improving the best-known appliance of the kind, there is no sense in rejecting the best thing obtainable merely because it does not conform in all respects to some arbitrary and preconceived requirements.

An important draft of regulations and conditions for securing the safety of the public has recently been issued by the Board of Trade to central station engineers and others; comments being invited before they are made a Standing Order. It is to be hoped, as an electrical contemporary observes, that all questions raised by the proposed regulations may be thoroughly thrashed out between those whom they may concern, so that there may be no occasion left for belated grumbling. We cannot pretend to discuss the subject here; but we shall reserve comment until fully qualified critics have had their say in the matter. Street boxes are duly mentioned, with the proviso that, where they contain any vacant space, they are to be so constructed as to prevent any influx of gas or water, either from the adjacent soil or by means of any pipes, and ample provision is to be made by ventilation "or otherwise" for the immediate escape of any gas which may by accident have obtained access to the box, and for the prevention of danger from sparking. Gas and water pipes are only hinted at by a clause providing that where any electric line crosses, or is in proximity to, any metallic substance, special precautions are to be taken against the possibility of any electric discharge to the metallic substance from their line, or from any metal conduit pipe or casing enclosing their line. At the first glance through the draft, there does not appear to be anything in it to hurt the electric lighting industry, if properly conducted.

THE REORGANIZATION OF INDUSTRY.

THE Co-operative Congress which has recently been held at Huddersfield is deserving of notice by all who may be concerned with the Labour Question; and readers of the JOURNAL, who have followed the recent controversy in regard to Mr. George Livesey's "workman-director" proposal, will be specially interested in this year's meeting of co-operators, from the fact of the President being that Mr. George Thomson whose experiment in the same direction was brought into evidence at a critical stage of this discussion. Mr. Thomson delivered an Inaugural Address which has been reported in all the leading newspapers, and has been commented upon by many of them from a variety of standpoints.

The speaker began his remarks by setting in sharp contrast the principles of co-operation and the principles of competition. With regard to the former, he claimed that "truth and purity must be the first conditions of life and labour; honesty the first condition of commerce; and justice the first condition of human relationship." He declared that, in the competitive world, the opposite characters prevail; and he hinted that the co-operative movement "is in danger of falling away from its own first principles, and becoming infected with the crying evils of the mercantile community." Passing on to the condition of labour under the influence of co-operative principles, Mr. Thomson observed that "where labour, by its increased efficiency and economy and harmonious working, contributed to the increase of the product, it undoubtedly should share in the increase it helped to create. But it was to him a comparatively minor question (to be settled by friendly discussion) as to whether that increase should be distributed individually or take some other and more collective shape—say, sick pay, old-age pensions, or associated homes; the latter being a field in which there is immense scope for co-operative enterprise and economy." The funds for all these provisions would not come necessarily out of the pockets of the consumer.

Coming to "the more important question," as he termed it, of the determining voice in the control and development of the life of labour, Mr. Thomson told how the Scottish Wholesale Society had admitted to their quarterly meeting a representative of the workers, who thus had a voice in the management. Although not much in itself, the speaker claimed this as a recognition of the "rational desire and right of every human being to have some voice in the control and development of his life;" and he insisted upon the importance of not leaving to the consumer the sole power to control and regulate industry. Unfortunately, as Mr. Thomson would say, this is just what the consumer does in practice, through the operation of the market. He recognized this as a fact; twitting Mr. Chamberlain for saying recently that the margin of profit had almost disappeared in nearly all our leading industries—of course, owing to the unfavourable state of the markets, which are all on the side of the purchaser. Yet notwithstanding this deplorable state of things, during the first three months of the present year no less than 30 millions sterling of new capital has been subscribed in extending and promoting the enterprise of public and speculative companies, as against only 13 millions during the corresponding period of last year. Where did all this money come from, if not from the profits of the trading classes? Still, Mr. Thomson admits that the rate of profit in the competitive world is diminishing. But this is because too many are trying to live on profits, and because blind empiricism in commerce is defeating its own ends. On the other hand, "depressions were unknown in co-operative business; its record was one of continued progress; and there were no dislocations of industry. They had few strikes; and he believed there would be none when they fully recognized the claims of the worker to a voice in the control of his industrial life." This was all that Mr. Thomson had to say respecting a matter on which the industrial world would gladly have heard more from him.

Discussing the proceedings of the congress, *The Times* remarks that these indicate a healthy and widespread interest in co-operative principles, as well as a steady increase in the number of societies applying them in practice. It is true that the applications are mostly in the sphere of distribution, where the problems to be solved are comparatively simple. "Still some fairly successful experiments are recorded in certain manufactures; and it is productive co-operation which at present occupies the attention of the most active advocates of industrial reorganization. The more ardent spirits are not satisfied with the profit-sharing to which masters in many cases admit their workmen. What is demanded is not only a share of profits but also a share in management and control." Naturally, *The Times* thinks the latter a very serious question indeed. It has been done in several trades, and may possibly be done in others; but not in all. "When larger demands are made upon the invention, the enterprise, and the general business capacity of the manager, it will be found much more difficult to carry on business upon co-operative principles in their more extended sense." The same remark will apply to the joint-stock principle in trade. Indeed, the discussion of the co-operative method of securing to workmen a share in the profits remaining after wages are paid, leads *The Times* into something very like Colonel Makins's position. "The essence of the matter is that they become capitalists—no matter on how small a scale—as well as workmen. It is as capitalists, not as workmen, that they take their share of profits in a co-operative concern. Hence, so long as they manage to save money, and invest it profitably, *it does not matter much whether it is invested in the business with which they are identified as workmen or in another.*"

Pausing for a moment to draw particular attention to this statement (which we have italicized for the purpose), we will follow the gist of *The Times* article to its conclusion. This is that the modern joint-stock system of trading is only another form of co-operation. "Working men ought not to overlook the ordinary facilities which they enjoy in common with the rest of the population. If they have money to put into the business from which they draw their wages, it is open to them to share in the profits of a hundred other businesses." That is to say, the workman is to put himself in the position of any other kind of capitalist. "They will probably find it, on the whole, advantageous to put their money into concerns not exclusively owned and managed by their own class," but to

invest "their savings through the ordinary channels in well-chosen undertakings." Then the workman becomes *ipso facto* a co-operator; and "whether it is better for him to put his money where he gives his labour or to invest it somewhere else, is a question which cannot be answered on general principles." Again, the article reiterates the declaration that workmen "cannot share in the profits and the control of any business except in the capacity of small capitalists. When once they are in possession of capital, their choice of investment is fairly wide; and they ought not too hastily to assume that the business at which they personally work is the only one, or the best one, in which they can purchase a share of profit and management. The educational effect of being interested as proprietors in other undertakings ought not to be less than that of being interested as proprietors in the particular business from which they draw their wages." We have given these extracts at some length because they represent a very prevalent cast of thought in regard to the question at issue.

Mr. Thomson and those who think with him upon these matters will probably, however, throw down their copies of "the leading journal" in disgust on perceiving how hopelessly their cause is misunderstood by it. Surely, they may ask, at this time of day, with all the literature of profit-sharing enterprise to refer to for enlightment, only a writer wilfully ignorant of the whole subject could pen such a sentence as the one we have italicized, which constitutes the text of the article. Profit-sharers contend that it does make all the difference in the world, both to the workman and to the undertaking in which he is employed, whether or not he has an interest in the profit made—that is to say, in the commercial success of the enterprise. Unless this is the truth of the matter, the whole case for profit-sharing falls to the ground. It is hardly necessary to argue the point; but whether one is a believer in the principle or not, to say nothing of its development into the region of control of industry, it is disappointing to discover that a member of the editorial staff of *The Times* knows so little about it.

The question of profit-sharing, or of workmen directors, is not exclusively one of co-operative trading or production; and we agree so far with *The Times*, that working men "ought not to allow themselves to be too much allured by the prospect of controlling their own capital in exclusive association with men of their own class." It is quite true that it will often pay them better to join with other and larger capitalists; but when they are told to do this "by investing their savings through the ordinary channels in well-chosen undertakings," they may well protest against the staleness and futility of the advice. Unless the older and large capitalists hold out a hand to the workman, he cannot, in the great majority of instances, join them at all; and in any case, how is he to know that a particular investment is likely to turn out well or the reverse? It is not true to say that the only claim a workman can have to share in the profits of a concern is that of a capitalist—if the term capitalist is meant to bear its ordinary, financial meaning in this connection. There is a sense, however, in which the workman is himself part of the capital of the undertaking in which he is a labouring unit. His training, his experience, his goodwill towards the concern are in a very real sense part of the capital. There is a great and notable difference between the financial circumstances of an undertaking in which the workpeople are not disposed to strike, and those of a similar undertaking which has to expect strikes, and may have recourse to locking-out at any moment. The emptiness of *The Times* argument is, moreover, capable of being illustrated by the hypothetical case of a thrifty workman who might be induced to strike for more wages, to the injury of his own employers, in order that he might have more money to invest in some other concern. The trouble that has during the past few years befallen so many Building Societies, again, is an illustration of the danger of leaving the working classes, whose savings have so largely gone in this way, to fend for themselves as mere capitalists.

Nobody pretends that every single business is a suitable one to receive as capital the assisted savings of the workpeople employed in it. But there is a very large field open for experiment in this direction; and we are not singular in believing that the great protected industries of the United Kingdom are more specially adaptable to this reorganization of our industry. Joint-stock trading has been spoken very hardly of ere now; and it cannot be denied that many base and cruel things have been done under its name. But if the joint-stock principle, with or without statutory protection, is found favourable to the progressive redemption of the wage-earner—if, by a modification of the system, the workman can be placed in the position of having some voice in the control and development of his life, to which Mr. George Thomson looks as his industrial ideal, then the principle will have gone far to redeem itself also from much of the odium that has attached to it up to the present time.

Belgian Briquettes.—The exports of briquettes from Belgium in the first three months of this year amounted to 91,793 tons, as compared with 137,594 and 93,446 tons in the corresponding periods of 1894 and 1893. In these totals, the exports to France figured for 38,432 tons, 54,412 tons, and 46,938 tons respectively. The Belgian briquettes sent to Switzerland are also of some importance. The aggregate exports of Belgian briquettes last year were 573,607 tons, as compared with 489,225 tons in 1893.

REGISTER OF PATENTS.

Starting Device for Gas-Engines.—Davis, E. J., of Handsworth. No. 11,108; June 8, 1894.

This "self-starter" for "Otto cycle" or other compression engines permits of the charge being compressed just before starting the engine; so that the storage of compressed air is unnecessary, and, except for getting the engine into position for a start, no manual labour is required.

The arrangement is as follows: A tank filled with water is fixed at a suitable height; and a reservoir containing air, and connected to the tank by piping and valves, is placed as low as possible—say, on the engine-bed. This reservoir is again connected to the combustion chamber or clearance space of the engine cylinder by suitable valves; and another connection between the air reservoir and the combustion chamber is made to pass through a smaller vessel, which can be shut off by suitable valves from both the air reservoir and the cylinder. This smaller vessel is connected to the gas-main; and a piece of piping, ending in a cock leading from the small vessel, may be placed in a suitable position for lighting, when the gas is turned on.

The action is as follows: Supposing the water-tank to be filled with water, and the air reservoir filled with air, and all cocks and valves closed, gas is turned on from the main into the small vessel, and the little cock is opened. A flame is held near this cock, or it is otherwise determined when the vessel is full of pure gas. Then, having turned off the gas from the main, and closed the small cock, the valve connecting the water-tank and the air reservoir is opened, and the water, due to gravity, rushes into the air reservoir, compressing the air contained therein. Having placed the engine in a position to start—that is, with the crank just over the inner dead centre, in the working stroke—all connections between the air reservoir and the cylinder are opened in such a way that a part of the compressed air (or in cases all of it) has to pass through the smaller vessel filled with gas, so that an explosive mixture is obtained within the cylinder.

Liquid Meters.—Tylor, J. J., of Newgate Street, London. No. 11,504; June 13, 1894.

It is well known, says the patentee, that in rotary or inferential meters, water passes through without being registered, when the velocity of the liquid is not sufficient to set the fan or other measuring instrument in motion; but in certain arrangements of such meters, special means are provided for measuring the quantity of liquid that would, under these circumstances, pass through the meter without registration. The arrangements consist in combining with the main rotary or inferential meter a secondary meter, placed in a bye-pass, and capable of measuring small flows that would not be measured by the larger main meter.

The present invention relates to this arrangement of combined main and secondary meters; and it consists of certain means for putting the main or secondary meter into or out of action, according as the velocity of the flow of water varies. This is attained by arranging in the main-inlet to the meters a valve-box having two outlets—one leading to the main meter, and the other to the bye-pass in which the secondary meter is placed; the outlet from the secondary meter leading to the outlet of the main meter in the usual way. The valve-box is provided with valves so arranged that, when the outlet from the valve-box leading to the main meter is closed by one of the valves, the outlet from the valve-box leading to the bye-pass and secondary meter is open, and *vice versâ*.

Regulators for Gas, Water, and Other Fluids.—Dupont, J. L., of Paris. No. 12,108; June 22, 1894.

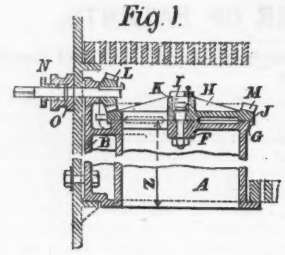
In applying this invention to the regulation of gas, the patentee employs a disc or ring of some compressible material—such as india-rubber—through the disc being openings. On either side of the disc, are plates of metal or hard material of saucer shape; also having openings through them. The edges of the plates bear on the compressible disc; so that, when the plates and discs are under pressure, the openings in the latter will be reduced in diameter, and *vice versâ*. These parts are arranged in a casing formed in portions, screwed together, so that the disc may be compressed, and the size of the openings regulated. The casing is provided with an inlet and outlet, and with means for adjusting the parts—such as a handle. When used for gas, the casing may contain cotton wool, or "some material which will cleanse" the gas in its passage through it.

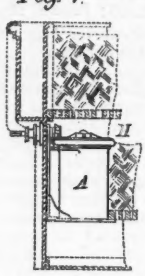
Valves for Gas-Purifiers.—Cripps, F. S., of Great George Street, S.W No. 2092; Jan. 30, 1895.

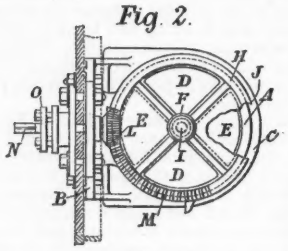
This valve is constructed to admit of bye-passing any layers of material in gas-works purifiers. It is designed to be fixed at one or more of the lower tiers of sieves or grids carrying the purifying material; so that, in the case of excessive back-pressure being given by any particular layer, the valve can be opened, and render immediate relief by bye-passing that layer only. Then, instead of having to force the gas through the purifying material which has become used up, choked, and hard, it can be passed direct to the fresher and more open material above; thereby obviating the necessity of changing the purifier simply on account of the material in the lower portion being choked. The valve is fixed inside the purifier; but it is actuated and worked entirely from outside. It consists essentially of three parts—viz., the body, the valve, and the gear for opening and shutting it.

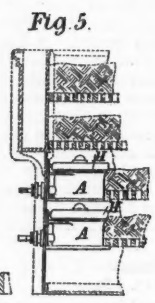
Fig. 1 [next page] is a sectional elevation, with the gearing above the valve; one-half showing the open ways through the valve and seating, the other half the solid webs of the valve and seating. Fig. 2 is a plan, showing the valve open for the passage of gas. Fig. 3 is a section, showing the gearing when placed below the valve. Figs. 4 and 5 are elevations, showing the manner of fixing in the purifiers.

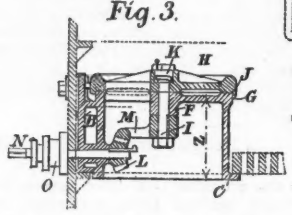
The body A is a rectangular or circular pipe casting, prepared with flanges B for fixing to the side plate of the purifier. The body is of about the same depth as the layer of purifying material through which it passes; and around its bottom edge a shelf C is cast, to carry the sieves abutting against it. The upper end of the body is divided into several segments, half of which are open D, and half are solid E









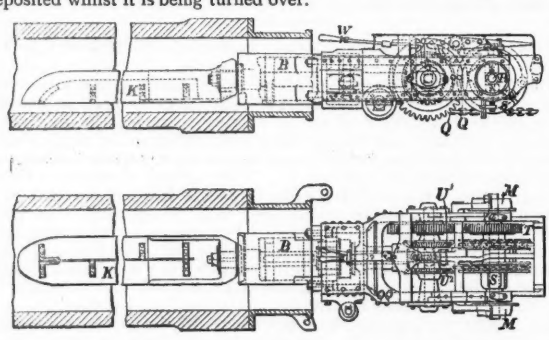


alternately. In the centre is a boss F for carrying the valve-spindle. The upper edges and surfaces G are faced, to form the seating for the valve to work upon. The valve H is a circular disc or grid-valve of cast iron, turning on a centre-pin I, and having divisions alternately open D and closed E—being in this respect the exact counterpart of the faced body on which it works. A lip J projects downwards, so as to clasp the circular face and seating on which the valve works, and exclude grit, &c., from the working faces G. The under surfaces and lip are faced; and the valve is provided with means for lubrication in all working parts.

In addition to the weight of the valve keeping it down on its face, a volute spring K surrounds the centre spindle, causing increased pressure between the surfaces, and ensuring that gas shall not pass the valve when it is shut. The gearing for actuating the valve consists of a bevel pinion L and wheel or segment M. This latter is either cast solid on the rim of the upper surface of the valve, or is a separate casting fixed below the valve, as in fig. 3. In the latter case, the valve and wheel or segment are both fixed to the centre spindle I. The pinion is turned by a short spindle N passing through a small stuffing-box and gland O on the purifier side-plate, and a guide-bracket or boss, cast on the body. A quarter turn of the valve will open or shut it. The depth of the body Z is made to suit the pitch of the sieves or the depth of material in the purifier.

Charging Gas-Retorts.—West, John, of Miles Platting, Manchester. No. 5036; March 9, 1895.

This invention relates to apparatus in which the charger scoop is sent into and withdrawn from the retort twice—once on one side and once on the other—to make a complete charge, and in which the scoop is turned over alternately in the direction of that side up which it is sent to deposit the coal alternately at the two sides of the retort. The invention consists essentially in sending the scoop centrally into the retort each time, and in automatically moving the scoop sideways from its central position towards that side on which the charge is to be deposited whilst it is being turned over.



The carriage Q supporting the scoop K is provided with one central front wheel and two back wheels M at the sides. The centre or front wheel runs on the top of the centre rail of the suspended frame of the charging-machine; while the two back wheels run with their upper surfaces bearing against the underside of the top flange of the suspended frame of the charging-machine. The two back wheels are mounted loosely on the axle R, which can be adjusted in slides to throw the scoop level. Upon the axle, and between the sides of the carriage-frame, is placed a long pulley or barrel S, provided with groves for two chains. The axle has a stop upon it to prevent the barrel making a complete revolution. There is also a spur-wheel T bolted to the barrel, and transmitting motion to another shaft by means of a spur-wheel in gear with it. On the shaft to which it is fixed, are placed two bevel wheels U^1 and U^2, running loose upon it, but kept in gear with a bevel pinion keyed on the end of the crank-shaft. One bevel wheel U^1 gears with the bevel pinion on one side; while the other wheel U^2 gears with the same bevel pinion, but on the opposite side. Each bevel wheel is provided with clutch teeth; and there is a sliding clutch between the bevel wheels, driven by a feather or square on the shaft, so that it can be put into gear with either of the bevel wheels by means of a hand-lever W, which slides the clutch along the shaft as desired. By this means the shaft is forced to make a portion of a revolution in either direction, according to which wheel the clutch is in gear with.

In order to allow of the horizontal sideways motion of the shaft carrying the scoop, a tube B is fixed to the carriage-box at one end of the charger carriage Q. It has one or more horizontally elongated bearings and curved internal cam paths corresponding with cams on the scoop-shaft. The tube B is recessed at the bottom to receive the cams of the shaft, when shaft and scoop are in a central position. The cams are situated between the two ends of the scoop-shaft, in such a position that they hang vertically when the scoop is in the central position. The outer end of the scoop-shaft is fitted with a feather and nut to receive the headstock socket of the scoop K.

When the crank-shaft is made to revolve by the action of the bevel gear wheels, the crank drives and causes the scoop-shaft to move along its elongated bearings, until the distance from the centre of the shaft to the point of the cam is equal to the distance between the centre of the shaft and the end of the cam path, thus allowing the cam to be carried round the circular cam path by the continued rotation of the shaft. The cam thus prevents the shaft (and with it the scoop K) from returning towards its central position until the proper time has arrived for reversing the scoop for refilling the coal. The scoop does not require when working to make more than half a revolution in one direction or the other.

Gas-Burner Operating with an Intimate Mixture of Gas and Air.—Denayrouze, L., of Neuilly, France. No. 7722; April 17, 1895.

The patentee remarks that, having ascertained by a series of experiments that it "is possible to obtain with an incandescence gas-burner an extraordinary degree of incandescence with a mixture of gas and air at a weak pressure, if the mixture of the combustible and the supporter of combustion is effected rationally in an intimate manner in the vicinity of the burner by the agency of a very small force," he has arranged such burners that the small amount of energy required for producing the mixture is supplied by the waste heat of combustion.

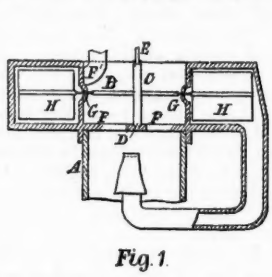


Fig. 1.

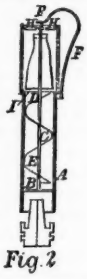


Fig. 2.

In fig. 1, above the glass A of the incandescent mantle, there is arranged a small wheel B with helical vanes (similar to a mica smoke disperser). This wheel carries with it, in its rotation, an axis C, turning in a step-bearing D, made with the accuracy of clockwork. The other end of the axis turns freely in a bearing E formed at the upper part of the frame F, which carries the whole system, and rests with frictional contact on the glass. Each vane of the suction wheel is extended by a straight thin rod G, which is expanded into a fan-like blade in the interior of an annular ventilator H. The external air and the gas arrive in the central part of this ventilator through an inlet F^1. They issue therefrom at the outer circumference; and, passing through the bent tube shown, to the lower part of the mantle, they find an exit through an orifice provided with wire gauze.

Fig. 2 is a Bunsen burner, with gas-holes sufficiently far apart, opening into a suction tube A of diameter sufficiently large, and of sufficient length, with air-inlet orifices suitably regulated. At one-third or half the height of the tube is a horizontal transverse bar B, light but rigid, carrying at its middle a small step-bearing, on which can turn a very light but rigid axis D, carrying an Archimedian screw of aluminium E, with one or more entrances. The screw has for its outer suction-casing the tube A forming the Bunsen burner itself. The screw stops short a little below the wire gauze I, which forms the orifice for the mixture or base of the burner. The stem of the screw is then extended, and passes through the incandescent mantle in the direction of its length; this part of the stem being made of, or coated with, sufficiently refractory material for the purpose. The stem carries at its upper part a wheel with horizontal vanes H, which forms a smoke disperser at the upper part of the glass, and which turns under the influence of the pressure of the hot gases escaping vertically. It is guided by a bearing either in the middle of a frame resting on the glass, or at the extremity of a light bracket F carried on the base of the burner.

The apparatus operates as follows: As in an ordinary Bunsen burner, the gas under pressure issuing through the narrow orifices of the lower diaphragm causes a sufficiently strong air-draught, and there is produced in the first part of the travel of the jets of air and gas—starting in a direction almost parallel—a penetration already tolerably considerable (says the patentee), as it is thus that it has been hitherto possible to produce the incandescence most generally utilized. But this quite moderately intimate mixture arrives at the base of the Archimedian screw, which—carried round by the same rapid movement as the vane-wheel at the top of the apparatus—catches up on their passage so to speak the threads of gas and air still only slightly mixed,

and bends, beats, and crushes them between the sides of the screw and those of the suction-tube, so as more than to compensate for the loss of pressure to which they will be subjected by a change of direction pure and simple.

APPLICATIONS FOR LETTERS PATENT.

10,356.—KEY, J. T., and KEY, W. S., "Manufacture of coke, construction of coke ovens, and recovery of bye-products." May 27.

10,414.—GIBBONS, W. P., and GIBBONS, G. B. A., "Charging gas-retorts." May 27.

10,428.—TANGYES LIMITED and JOHNSON, W., "Compressing air or gases." May 27.

10,439.—SMITH, J. G., "Gas-governors." May 27.

10,463.—SCHULKE, A. H. J., "Conducting air to the flames of gas, petroleum, and other burners for lighting and heating." May 27.

10,477.—LADD, J. H., "Manufacture of gas." May 27.

10,502.—LANCASTER, E. W., "Moveable pendants and brackets for suspending and carrying electric, gas, or oil fittings." May 28.

10,546.—UPTON, C. S., "Gas-burners." May 28.

10,569.—MASSY, E., "Electrical apparatus for lighting gas." May 28.

10,697.—FIDDES, W., "Discharging gas-retorts." May 30.

10,730.—NALDER, F. H., CRAWLEY, C. W. S., SOAMES, A., and TROTTER, A. P., "Photometers." May 30.

10,735.—JOYCE, M. J., "Construction of beds for gas and other retorts." May 30.

10,743.—STRINGFELLOW, J. H. W., "Incandescent gas-burners." May 30.

10,757.—SLOPER, E., "Mica chimneys or tubes for gas-burners." May 30.

10,758.—ABEL, C. D., "Combined locomotive gas-engine with car." A communication from the Gasmotoren Fabrik Deutz. May 30.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Mr. Broadberry's Paper on Carburetted Water Gas.

SIR,—So long as Mr. Broadberry confined his remarks to a statement of his own experiences with a carburetted water-gas plant, his paper at the recent meeting of the Incorporated Institution of Gas Engineers was both interesting and, of course, reliable. It is to be regretted, however, that he made assertions regarding a plant with which he has had no experience, nor ever seen in operation, which are not in accord with facts, and drew inferences therefrom which are calculated to mislead the uninitiated. We should, however, feel obliged to Mr. Broadberry for the opportunity afforded us of putting him and others interested "straight" upon the subjects. The following observations are intended to correct certain statements made in the paper, and during the discussion thereon.

Mr. Broadberry stated, and correctly, that "for wide experience, it was necessary to look to America," where carburetted water gas had been made successfully for a "quarter of a century," where it was found that the largest Company there used the double superheater type of apparatus. The Company referred to can only be the United Gas Improvement Company, with which the writer and his colleague, Mr. Merrifield, were both associated. As a matter of fact, this Company have adopted, and are using at several of their works, the combined superheater and fixing chamber, and they have also, in some instances, sold apparatus having the combined chambers. It is, however, true that they are now adopting the double superheater type for all extensions and renewals. The obvious reason for this is that the improved forms of combined superheater (which are giving better results than the double) are patented and controlled by other companies; the most important being the property of my own Company. This, of course, precludes their adoption by the Company alluded to by Mr. Broadberry.

Referring again to the double superheater type, Mr. Broadberry claims for it the advantage of spraying the oil centrally, and disposing of it evenly over the top of the checker-work—a position, he says, "which is not available in the combined machine." In actual experience, it frequently happens that, when admitting the oil as above described, and passing on *downwards* direct through the carburettor, it is not "gasified" before reaching the bottom of the superheater (the second or last chamber). This condition is amply proved from the quantity of oil *vapours* and liquid oil which are so often seen when looking through the lower sight-cock of this carburettor; and in some cases we have found the bottom brick linings of this vessel disintegrated by the oil soaking through, while in others we have seen the steel bottom of the shell completely destroyed.

With regard to Mr. Broadberry's reference to the height of the apparatus and the points of admission of the oil, which he says is introduced in a combined setting "several feet up, and the active fixing surface consequently reduced," with heavy oils found outside the United States, so thick that at times it clogged up the pumps (heavy oils which the double superheater failed to deal with effectually until the improvements that are embodied in our patents were added), we have found, by actual experience, that the height required to *absolutely* fix the gas is a number of feet less than the height quoted by Mr. Broadberry; thus emphatically indicating that the carburettor or first shell of the double superheater is of little or no value as a "fixer," and that this operation is all performed in the second chamber of this type of plant. The above effectually deals with the point raised as to the alleged loss of effective surface in the combined superheater, though it might appear different in theory, and to those who have had no actual experience with the two types of apparatus referred to.

It can easily be seen also, by reference to the illustration of the double superheater plant, that there is a considerable waste of space not available as surface for fixing, as, for instance, at the top and bottom of the carburettor or first chamber, equalling about one-third of the height of that vessel. In the case of the combined superheater and fixer, there is no such loss of surface; every part of the combined vessel performing its proper work throughout.

The total height of the combined fixing chamber is but a few feet more than that of the double superheater, which is the only actual gasifier or fixer of this type of plant, as has been before shown. The combined form has been proved to be better able to deal with the heavier oils now in the market. The stack-valve is only a very little higher than that of the double superheater, and easily reached by a ladder from the operating floor.

Again with regard to the point of admission of the oil, and the alleged loss of surface. In the combined superheater and fixing chamber, the oil being admitted at and from the *centre* of the top of the vaporizing chamber, is forced in a *downward* direction, meeting the *upward* passage of the hydrogen gas; and the lower part of the combined chamber, which we term the "superheater," effectively heats the hydrogen gas, vaporizes the oil-spray, and gasifies all the lighter hydrocarbons—the heavier ones being as effectually dealt with in the upper portion thereof. As a matter of fact, very nearly the whole surface of the combined vessels is employed as a fixer.

Mr. Broadberry also states that "since these matters were under consideration at Tottenham, alterations have been made in this type of machine [the combined] by which, if desired, the water gas may be carried to the top of the superheater, and the oil there sprayed in, so that the whole length of the superheater is used as a fixing chamber." This is not correct, as the date of our patent for the arrangement referred to will prove. It was applied for on April 25, 1893; accepted, June 2, 1893 (No. 8371), or about one year *before* Tottenham was in the market.

This arrangement is intended only to secure an occasional down-run, and prevent thereby too great an accumulation of heat at the top of the fixing chamber, which, with continuous working, is found at the top of the double superheater, and causes an objectionable accumulation of lamp black. It will be seen that by this particular arrangement we utilize the otherwise waste and improperly situated heat, and have such control over the heats as is unattainable with *any* other form of superheater or fixer. The number of down-runs is regulated by the heat at the top of the vessel referred to. The arrangement is not complicated, nor has it been designed to obtain a full-length heating surface (this is obtained by working in the ordinary direction), though it may not appear so to Mr. Broadberry; but a closer acquaintance with the subject will put him right.

Mr. Broadberry gives as the result of only a three days' test—during which short period it may reasonably be assumed that every matter was carefully watched and attended to—the fuel account for the generator only at 37·43 lbs. per 1000 cubic feet of gas made *plus* 8·57 lbs. for the boiler, or a total of 46 lbs. per cubic feet. In the discussion on the paper, it was pointed out by Mr. Mead that this result was not at all phenomenal, as with the combined form of plant the same results could be obtained with an expenditure of at least 20 per cent. less fuel. As actual proof of the above, during the last week we have have received a monthly statement of the working of some sets only a very little larger than those at Tottenham, which gives the day-by-day working of groups of our machines during December last, and shows that a 26-candle power gas was made from 4·04 gallons of oil and 32·1 lbs. of fuel per 1000 cubic feet—the above oil and fuel being all the raw material used, including the boiler fuel. It is worthy of remark that these results were obtained in December, and in ordinary daily working, when the thermometer registered about 30° of frost. The candle power is based upon the official inspector's testing at a considerable distance from the works. With one of our machines, 1 ft. 2 in. less in diameter than those at Tottenham, we have run regularly along on 30 to 32 lbs. of fuel in the generator, as compared with 37·43 lbs. at Tottenham. At Ottawa, with a plant 1 ft. 2 in. less in diameter than that at Tottenham, when running *but about ten hours a day*, and not continuously, the average for the last three months of ordinary working has been but 38 lbs., as compared with 37·43 lbs. at Tottenham.

In the analysis of the gas given in the paper, the quantity of carbonic acid is 6 per cent. in the crude gas; and in the three days' test the candle value per gallon per 1000 cubic feet is stated to be 6·7 candles. From experiments personally conducted, and spread over many weeks, I am safe in saying that the analysis given was not that of the gas made during the three days' test referred to; also that when the gas of which the analysis is given was made, the apparatus must have been handled in a very inefficient manner, for the quantity of carbonic acid is twice as much as it should have been.

When replying to the discussion, Mr. Broadberry stated that as low as 30 lbs. of generator fuel per 1000 cubic feet was obtained with plants of the double superheated type. The figures I have given are from cold fuel; and I challenge Mr. Broadberry to name any place where such results are being obtained with cold fuel in a double superheater type of plant. We know of but one place where so small a quantity of fuel is used; but it is hot, not cold. With hot fuel, our plant would take considerably less than with cold.

I will draw your attention to a report of proceedings at the meeting of the American Gaslight Association held in October last, at Washington, where various working results were quoted, and none equal to those quoted by the Engineer of one of the companies using our type of plant.

J. T. WESTCOTT.

June 5, 1895

Sloping Retorts at Brentford.

SIR,—Perhaps Mr. Husband would kindly add to our obligations by bringing his figures, *re* "Slopers," more up to date. In the JOURNAL for May 28, we were told that 50 per cent. of the coal carbonized in 1892 was done by inclined retorts. The corresponding figures for 1893 and 1894 would be of considerable assistance towards getting an idea of the benefits derivable from the system.

If not asking too much, I should be glad to learn what is comprised in "Cost of Carbonizing." Does it include all labour, &c., from the coal-store to the coke-ground? or does it only represent the labour of charging and drawing the retorts?

Mr. Husband mentioned at the Institution meeting that some outside labour got charged by error to carbonizing. If he could eliminate this, the figures would be more comparable.

The adoption of inclined retorts entails the erection of machinery for elevating and transporting the coal from the store to the retort-house. If there had not been corresponding machinery for the ordinary settings, part at least of the saving might have been effected in that way.

As the make of gas per ton shows a persistent tendency to decrease, would Mr. Husband say whether the quality of the coal has been altered. If so, why? Or is there any other explanation of a falling off which I understand has not been compensated for by an increase in quality.

T. P. Travers.

Cork, May 31, 1895.

Sir,—Three correspondents, I find, have taken some notice of my letter of the 22nd ult.; but I am sorry that not one of them has replied to the question that that letter contained. Not only is this the case, but your first correspondent, in his rather verbose and pointless communication, has not even taken the trouble to carefully read my letter, for he has both misquoted and misunderstood it. I did not complain "that part of Mr. Husband's paper on 'Sloping Retorts' was meaningless and *incomplete*." I said that the last paragraph of that paper contained a reference which to me was "quite meaningless and *incomprehensible*." I would point out to your suburban correspondent that a paper may be quite complete, and at the same time incomprehensible in some of its details. The adjectives, I may inform him, "incomplete" and "incomprehensible," are not synonymous.

Then, again, your correspondent says: "I cannot understand anyone saying that a paper is meaningless when it describes a radical system of economy in money and in labour to the tune of about 50 per cent." From reference to my letter, and from what I have already written, it will be obvious to anyone that I never said Mr. Husband's paper was meaningless. I applied that epithet distinctly to the last paragraph of the paper, and to that alone. As to the paper as a whole, I referred to it as "satisfactory in some of its particulars." It hardly seems, therefore, quite fair that the gentleman in question should take as the text of his wandering remarks a misquotation and a misstatement.

My use of the word "outsider" was, I am sure, quite obvious to most minds, though as it occurs no less than half-a-dozen times in the reply to my letter, its meaning might be enlarged upon. I meant, of course, that I was outside of the Institution of Gas Engineers, and therefore did not have the pleasure of hearing the paper on "Sloping Retorts" actually read, and consequently was not quite in the same position to judge of the exact bearing of any remarks made as those who were inside.

Your correspondent asks: "Why should an 'outsider' want to know whether paying a royalty on a patent for gas stoking can be evaded?" It is not a question of wanting to know any such thing; and the interrogation is altogether beside the mark. I, for one, should be the very last person in the world to withhold any royalty that might justly and honestly be demanded for any improvement of any kind; and the claims of the man whose brain conceived or perfected such improvement ought always to be paramount. But I must confess that I am somewhat amused that an appeal should be made, "as an Englishman," for the satisfaction of these lawful claims, by one who bears the patronymic of Van Vestraut.

Finally, I repeat my original question, which has been altogether ignored. What was the reason for the detailed drawings of the Brentford settings being sent to the Automatic Coal-Gas Retort Company, and what is the full significance of the concluding paragraph of Mr. Husband's paper?

C. E. Brackenbury.

7, Drapers' Gardens, E.C., June 5, 1895.

Gas Purification in Medium-Sized or Small Works.

Sir,—Having carefully read one of Mr. Carpenter's pamphlets on the "Purification of Coal Gas," referred to in the Journal a short time back, I thought a few lines, giving my opinion upon it, and showing the advantages of its study, might probably be of service to managers of similar-sized works to my own. I consider it an excellent work, and moreover so simple that managers of my own class can easily understand it; and no student in the gas profession should be without it. It will form a very useful addition to any gas manager's library—in fact, I may call it a perfect light in the purifying-shed of a small works, as managers of such works generally work merely by rule-of-thumb. We know a chemical action is taking place; but how or why it does so we have not sufficient chemical knowledge to understand. With Mr. Carpenter's practical pamphlet in our possession, however, we may soon be on the right track. The benefit of its study does not end here, as, by his method of working the purifiers, the lime is used to much greater advantage. This means economy, by the work being done with less lime and labour; and last, but not least, there is a purer atmosphere in the dwelling of the consumer, and also an increased dividend for the shareholders.

T. Cross.

Cannock, June 6, 1895.

Armagh in Darkness.

Writing on the subject of the paragraph under the above heading in the last number of the Journal (which, we may explain, came from a local source), Mr. J. Whimster says it was the result of a hoax perpetrated upon a too credulous newspaper correspondent anxious for "copy." In the first place, the pressure had been put on barely an hour when the "incident" is said to have occurred; and, of course, he would not be reducing it as early as nine o'clock on a summer evening. Then the old man who was stated to have caused the trouble had been on the sick-list for six or seven weeks, and was not near the works. He explains the matter as follows: "The only foundation there was for the entire affair was that on that evening, shortly after the pressure was put on, an accumulation of water in one of the syphons showed itself by the flickering of the lights in the lower parts of the city, a few of which doubtless went out. But as the mischief was noticed and remedied at once, no inconvenience resulted, as the whole thing did not last five minutes; and, as it occurred just as people were beginning to light up, very few knew anything about it and everybody was surprised when they saw the paragraph."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS COMMITTEE ON LONDON WATER BILLS.

(*Before the Right Hon.* D. Plunket, *Chairman; Sir* J. Kitson, *Sir* H. Stafford Northcote, *Mr.* Baldwin, *Mr.* Burnie, *Mr.* Muntz, *Mr.* P. Stanhope, *Mr.* Ainsworth, *and Mr.* Briggs Priestley.)

Tenth Day—Thursday, May 30.

To-day the cross-examination of Mr. *Cripps*, Parliamentary Agent to the London County Council, was continued by Mr. Littler on behalf of the Kent and New River Water Companies.

Mr. Littler asked whether it was not the fact that, at the present moment, the aggregate market value of the water undertakings of the Companies was about £35,000,000.

Witness said that, approximately, it might be taken at somewhere between £30,000,000 and £35,000,000.

Your own report puts it at £34,000,000?—It has varied, of course.

Good investments are rather going up than down just now, are they not?—Yes, *good* investments. What are called "good investments" are sometimes very much over-estimated.

If the undertakings were acquired at their present market value, and the Arbitrator were to put on anything for prospective value, having regard to compulsory sale, the sum to be paid would be a large one, would it not?—If you can conceive the possibility of anything being added to the present market value, in the aggregate the price to be paid would be greater than the present value.

What would the effect of purchase on those lines be upon the Metropolitan rates?—Do you mean on the assumption that the purchase-money is paid out of the rates of the year?

No; if that were the proposal, every window of the County Council's offices would be broken, as well as the head of every councillor. But assuming the period was 60 years (which is the outside period allowed by the Police and Sanitary Committee for loans to run), what would be the effect?—That is a matter of calculation. You can easily find out what would have to be paid each year in respect of £1,000,000 of stock that is to be redeemed in a period of 60 years.

Can you give me the figures?—If you want them accurately, you should get them from some other witness. Of course, it makes a very great difference whether the stock is to be redeemed in 60 or in 80 years, or, as we think would be proper in all the circumstances of the case, in 100 years.

Your Bill does not provide for one or the other; but the Police and Sanitary Committee, under instructions from the House of Commons, have fixed the period at 60 years?—That Committee has nothing to do with this matter. The Money Bill we have before Parliament says 100 years.

I want to know if the debenture-holders and others are going to be under this proposal?—Well, you have stopped our Money Bill for the present.

But the Standing Order relating to the matter says 60 years?—No; the Standing Order provides that Bills promoted by the County Council for power to raise money shall be introduced as Public Bills, subject to this—that, in certain cases, they shall be introduced as private measures. It is laid down that, if they are introduced as Private Bills, they shall provide for the redemption of stock within a period of 60 years.

Can you tell me if any Bills have been passed within the last five or ten years, in which a public body has been allowed to exceed 60 years?—I take the Birmingham case as a precedent. The period in that Bill was fixed at 95 years.

The Bill did not relate to the purchase of an existing water supply, but was for the provision of a new and supplementary supply, is it not so?—You are wrong. I am referring to the Bill of 1875.

I am asking you for a case within the past ten years. Parliament, you know, has latterly adopted certain principles on this point?—Parliament has made it a principle to shorten rather than to lengthen the period.

If they think the money is wanted for a temporary, and not a permanent purpose, they shorten the period still further?—Yes.

Well, is it not the fact that you think before long you will be forced to take measures to obtain a fresh supply of water?—Personally, I am of that opinion; but whether or not the County Council will ultimately decide to take steps to obtain a new supply of water, I cannot say.

I am dealing with what they have already said. Mr. Bassett Hopkins describes the water taken from the Thames as "diluted sewage"?—Yes. I think you may take it that the County Council are for settling the matter on a different principle to that which would be involved in relying in perpetuity on the Companies' undertakings.

So that, if Parliament follows its own precedent, the period would be shorter than 60 years?—No, I do not think so.

In further cross-examination, witness said that the County Council were dealing with the conditions on which Parliament authorized the raising of money for the ordinary municipal operations which they had to carry on from year to year, such as street improvements, sanitary purposes, extension of water-works, tramways, and one thing and another. The sum they were being called upon to pay in connection with the present Bills was almost in the nature of a penalty. The amount they had to hand over was a condition precedent to the management of the water supply. They had never had to pay this money before, and they would never have to pay it again. They were not altogether, as Londoners, responsible for being called on to pay it; and therefore he thought they should be allowed as long a period as possible for the redemption of the stock.

Mr. Littler said that that which was of temporary effect was always put at a lower rather than a higher period.

Witness did not agree with the learned Counsel that the present purchase scheme would be of temporary effect.

Mr. Littler said he did not wish the witness to agree with him; but he would ask the Committee to decide which of them was right. In all cases outside London where water purchase had been proposed, not only had it been indicated by what authority the purchase should

be effected, but within what time it should take place. That was not the case with the present Bills.

Witness remarked that the Bills proposed that the transfer should take place as from a given date.

Mr. LITTLER: I am talking about the purchase. Do you know any case in which the transfer has taken place before the purchase?

Witness: No; I think not.

Then why do you proceed in that way with these Bills?—Because of the complicated nature of this matter. It may be eight or ten years before the sum to be paid for the undertakings can be ascertained.

I hope the Water Companies' property may not be under this danger for eight or ten years. If so, the Companies will be ruined before you come to arbitration?—It is intended fully to secure them by the clauses of the Bill. No doubt in the case of the purchase of land, you pay your money before you receive the title-deeds. But we have here to deal with a vast question which has been occupying attention for years; and we wish to terminate at once the chaos and confusion in which it is involved. We would secure the transfer, but make provision for the payment of the proper amount to you.

If you secure the undertakings of the two Companies which are the subject of these Bills, you may run them for eight or ten years, to the utter destruction, pecuniarily, of the other concerns?—You introduce into your question a supposition which is incorrect.

What is that?—That we are not disposed to purchase the rest of the Companies. You base your question on that hypothesis, which is altogether erroneous. In these Bills, we take two Companies together. If we had followed the course, for which there is a great deal to be said, of purchasing the Southwark and Vauxhall undertaking, having nothing to say to the Lambeth, we should, by the power so obtained, have competed with the Lambeth Company throughout the whole of their district, if Parliament had allowed us to do it. But we are not proposing that. We propose to buy the Southwark and Vauxhall and the Lambeth Companies together, on the express understanding that the Arbitrator shall have regard to the circumstances that exist by reason of the competition between the Water Companies.

If you want to buy out the Kent Company, why do you not do it now?—You are not willing to sell, or agree to any terms we propose.

We do not want to be sold. We consider your scheme extravagant and wasteful; but if Parliament thinks otherwise, we bow to it. However, we then say that we must have proper terms, and that the sale must be under proper conditions. Why are we to wait eight or ten years while you are settling with the Lambeth and the Southwark and Vauxhall Companies?—You have had a distinct assurance that the County Council intend in the future to bring forward Bills for the purchase of all the other Companies.

Now as to clause 12, which provides that contracts entered into by the Southwark and Vauxhall Company after the date of the notice of transfer (in July last year) shall be temporary only, why do you seek to invalidate contracts which have not been sanctioned by you—contracts honestly entered into?—The provision referred to is a perfectly fair and reasonable one. The clause will not operate unless the preamble of the Bill is proved; and if it is not passed, the provision should have effect so as to render any extravagant contracts entered into after the date of the notice nugatory. Liability to pay interest on the debenture stock will be undertaken by the County Council.

Mr. LITTLER pointed out that the County Council might decide that there should be free water. The Directors of the Water Companies were, of course, anxious to make a profit for their shareholders. But if the Council acquired the undertakings, there would be no Directors and no shareholders; and, beyond the obligation contained in the Act of Parliament, there would be nothing to secure the debenture-holders.

Witness remarked that the Companies treated the debenture stock case as part of the general case, in their desire to get the Bills thrown out. The promoters had no desire to interfere with the holders of debenture stock.

Mr. LITTLER said the promoters did interfere with them; and he should certainly advise his clients not to hand over their undertakings until the interests of the debenture-holders had been secured.

Witness observed that the Companies would have the purchase-money, and that it would be well to leave them to deal with the debenture-holders. The circumstances of the various Companies differed. Some of them would not wish to be wound up.

Mr. LITTLER remarked that, in the case of the New River undertaking, there was no Company to wind up.

Mr. PEMBER (on behalf of the Lambeth Company) said that clause 12 in the Southwark and Vauxhall Bill was clause 10 in the Lambeth Bill. That clause would not give the Council power to render voidable any contracts entered into since July last year without their consent, but it made them void at once.

Witness said the clause would have served its purpose by having been put into the Bill. He did not think it was likely that unreasonable contracts would have been entered into; and all proper contracts would be safe.

Mr. LITTLER: But the clause does not give you the power of saving contracts. It renders them void unless you have given your consent to them. Here is a concrete case. On the 17th of August, 1894, the East London Water Company obtained a Bill enabling them to spend £400,000 or £500,000 on storage works and filter-beds; and it was provided that additional filter-beds should be commenced as soon as practicable after the passing of the Act. Do you know that since July, 1894, a contract has been let for the making of reservoirs to the extent of £150,000?

Witness: I am aware that you have taken steps to carry out this work. The contract was not entered into with the consent of the Council. It would therefore be rendered void by this clause. I agree, however, that contracts of this class should pass with the transference of the water undertakings.

So that the clause will go out of the Bill?—Not at all. The question will simply be as to the amendment of the clause.

Mr. PEMBER (to the Committee): We leave the question of the Water Companies' charges to substantive evidence, if it becomes necessary to call it. I do not propose, on behalf of the Lambeth or any of the other Companies, to cross-examine witness on this matter.

In cross-examination by Mr. RICHARDS (for the Essex County Council), witness adhered to the statement in his evidence-in-chief, that he considered the case of the outside County Councils as affecting the details and not the principle of the Bills. The Surrey County Council were satisfied with the agreement which had been entered into with them; but, in regard to Essex, the Local Authorities desired an arrangement on different lines. They thought the water undertakings in the outlying districts should be under a Joint Board of Control on which the Local Authorities should be represented. Speaking generally, the promoters were willing to offer all the outside authorities an arrangement on the same basis as that come to with Surrey, subject to the consideration of any special circumstances in each case as to future requirements. The promoters desired to act in concert with local County Councils.

By Lord R. CECIL (for the Middlesex County Council): The London County Council were dealing with the Lambeth and the Southwark and Vauxhall Bills first in order to save expense. The result of the course adopted had not been to multiply the petitions by eight. It ought to have lessened their number as well as their contents.

In reply to the CHAIRMAN, the learned Counsel said that his case was this: The Bill provided for the supply of water to the outside authorities; but this was subject to the provision that these authorities might make arrangements with London to supply themselves. If he could show that it was impossible for them to make that arrangement, the Bill was left without the alternative; and it provided solely for the supply of water by London to the outside authorities. That would be an objectionable provision.

Witness said the agreement entered into with Surrey might not be effective without further legislation. He, however, believed it would be possible to insert in the Bill all the powers which might be necessary to enable the promoters to carry out their agreement with Surrey. They would be able to do the same thing in regard to agreements with other County Councils in the other Bills.

By Mr. J. C. LEWIS COWARD (for the Surrey County Council): In a report issued by the Local Government Board as to the agreement between the promoters and the Surrey County Council, it was set forth that the Board understood, from the promoters, that they desired to further the interests of the Local Authorities; that they did not themselves wish to become the Water Authority in the outlying districts; that the District Councils generally were in agreement with the promoters; and that the promoters did not desire to impose any charge on outside counties other than that attendant upon the present proceedings.

In re-examination by Mr. BALFOUR BROWNE, witness said the promoters were willing to make the debenture-holders secure in every way that was agreeable to the Companies. The period over which the promoters were to be allowed to pay for the undertakings did not affect the Companies. It was a question between the promoters and Parliament, though he hoped the Companies would agree with the County Council, for the reason that it would facilitate the payment of the Companies. Proposals for alternative water supplies had had a large effect on the buyers of stock, especially at the period of Mr. E. J. Smith's agreement. The price of water stock had fluctuated in accordance with the indications of parliamentary policy, so that the market value was not a safe guide as to the real worth of the undertakings. If purchasers had had these things in their minds, the Arbitrator should be allowed to take note of them.

By the CHAIRMAN: He did not think the report of the Royal Commission on Water Supply would come before the Arbitrator as part of the materials for his forming a judgment under these Bills, unless there were a special direction to that effect. Even if he could, he might not be in a position to deal with the report of the Commission, unless he was specially empowered, because the Companies might contend that the Commission was not Parliament, and that there had been no direction on the part of Parliament that they should ever do anything that the Commission had suggested.

The CHAIRMAN: Assuming that the findings of the Royal Commission were before the Arbitrator, to show that additional arrangements were necessary as to reservoirs, and, on the other hand, that it would not be necessary for a long time to go farther afield for a new supply, do you contend that, unless he gets special directions for the purpose, the Arbitrator will be unable, if he thinks fit, to take these matters into consideration?

Witness: I should hardly like to express an opinion as to what would be the power of the Arbitrator.

Do you see any reason why he should not consider these matters, if he thinks them germane to his inquiry?—He might be prevented by the Companies basing their case on the declaration that, up to a given period, they had had a certain income per annum.

In reply to further questions, witness said the 10 per cent. allowance for compulsory sale was not statutory, but was the outcome of general custom. Special provisions were inserted in Bills when it was intended that this custom should not apply.

Mr. BALFOUR BROWNE said that, in accordance with the expressed wish of the Committee, he would the next day call evidence to show the necessity of inserting in the Bill special instructions to the Arbitrator. He proposed to call Mr. Fletcher Moulton, Q.C., M.P., for this purpose. He trusted that, before the point as to which Mr. Moulton would speak was decided, the Committee would hear the arguments.

The CHAIRMAN said the Committee would be prepared to hear arguments on the point after the evidence. They desired to act fairly to all parties.

Mr. *A. R. Binnie*, M.Inst.C.E., the Engineer to the London County Council, was called shortly before the adjournment, and gave formal evidence as to the area and population within the jurisdiction of the Council, and as to the extent and character of the operations of the Water Companies. He had not concluded his evidence-in-chief when the Committee rose.

Eleventh Day—Friday, May 31.

On the resumption of the proceedings to-day,

Mr. *F. Moulton* Q.C., M.P., was examined by Mr. BALFOUR BROWNE. He said: I am here because I was a member of the County Council at the time these Bills were decided upon. I was not the draftsman, and

am not responsible for the form of the measures, though I have taken considerable interest in them, and have had large experience of arbitrations, under both General and Special Acts of Parliament. I have given careful consideration to clause 6 of these Bills, which gives directions to the Arbitrator as to the circumstances he is to have regard to in framing his award. I regard these directions as indications of what is meant by the words in the Bill, "fair and reasonable value of the undertaking." The purchase in this case is one which will involve the expenditure of a very large amount of public money; and it is most important that the Bill should leave no ambiguity as to what is the meaning of "fair and reasonable value." I can understand that an Arbitrator, having nothing but these words to guide him, might be at a loss to know exactly what was the price Parliament meant him to fix. I can imagine him making an interpretation of these words which would lead him to fix a very different price to that at which the County Council seeks to purchase the undertakings. I think it exceedingly important that this price should be left without ambiguity in the Act. An Arbitrator seeing the words "fair and reasonable value of the undertaking," might, perhaps, without any further instruction, imagine that this meant the total of what the share and debenture holders could get for their stock in the market—the total price which, just for the sake of simplicity, I call the "repute" price, or, in other words, the price depending simply on the repute of the undertaking. The London County Council, as I understand it, say that this would not be fair and reasonable value which they ought to pay. I can give the Committee an example. The shares of the tramway companies kept up their value almost to the end of the 21 years, which really was the limit of their concession. The public imagined that, as the companies had been paying dividends, they could go on paying them. The "repute" value in that case was, in my view, out of all proportion to the real value. I think, therefore, that the London County Council are entitled to be protected from having to pay a price due to ignorance on the part of the public, who cannot follow all the legal difficulties and complexities that define the position of the undertaking.

Mr. Balfour Browne: Then, in your view, the "repute" value of an undertaking may be very different from, and much exaggerated and beyond, the real and fair value?

Witness: It might be. The Arbitrator might adopt the erroneous view that he was to take a fair and reasonable estimate of the market value of the shares, and so calculate the price. I think the London County Council would not be fulfilling their duty if they did not do all they could to prevent the Bills passing in a form that would leave it possible that so serious a mistake could be made; and I think they are entitled to ask the Committee so to frame the clause in the Bill that this mistake shall not be made. But there are some other dangers from which, I think, they are entitled to ask the Committee to protect them. The value of an undertaking of this kind, if measured by the actual sum obtained by the undertakers, may be partly due to what I may call, without wishing to use irritating language, an "abuse" of their position. They may take a view of their legal rates which is an erroneous one; and they may do it with a considerable amount of safety, seeing that they are dealing with a large number of people, and that the sum they get from each person is comparatively small. They may with impunity exact more than they should do; or, on the other hand, they may render less service than they should. I am not saying that this is so, or going into the facts of the case in order to establish such a proposition; but I say that that is the view of the members of the County Council. Certainly, it is the view so far shared by the whole Council, that they consider it right that they should be entitled to put forward the grounds on which they hold their views. The returns of the Companies may be swollen by excess of charge or deficiency in the performance of duty; and there might be a return due to "abuse" of the undertaking. There might be an "abuse" value given even by persons who know everything about the undertakings, because they might say: "The impunity with which excessive charges have been levied in the past convinces us that these charges may be exacted in the future." The County Council ask the Committee to say that a "fair and reasonable value" shall be taken, on the hypothesis that the concerns are in the hands of undertakers who, to the full, act up to their duties, both in charging only their legal rates and in performing all their legal obligations, and, in the third place, in providing in the present and in the future for all their legal responsibilities. It might be difficult to express in language this "fair and reasonable" price which I have been describing. By far the best way to deal with it would be to indicate to the Arbitrator the important heads of consideration which he is entitled to look to in considering the price. I have examined the various heads which the Arbitrator is directed to consider; and I do not think there are any which it is not legitimate to bear in mind in calculating the price. When you have indicated that these are proper and legitimate elements for him to consider, you have told him the sense in which you use the words "fair and reasonable value." I am confident there would be ambiguity in the clause, in the absence of a definition of the price to be given.

Mr. Balfour Browne: Then your view is that, without an instruction, an Arbitrator left free to find a "fair and reasonable value" would probably take into consideration the "repute" and "abuse" value, or might leave future possibilities out of consideration altogether?

Objection was taken to this question, on the ground of its leading character.

Witness (continuing): I think that, without an indication of this kind, no Arbitrator would feel himself at liberty to fix the price consistently on the principle that I have defined as the one on which we ask that it should be fixed. I am sure there would be ambiguity in the absence of a definition of the price at which the purchase is to be made, which should not be allowed to exist in so important a matter.

Mr. Balfour Browne: I will ask you a question on each of these heads. In determining the fair and reasonable value of the undertaking, the clause says the Arbitrator shall have regard to the condition and state of repair of reservoirs, filter-beds, and so on, and the probability of future expenditure thereon. Is that instruction necessary, in your opinion?

Witness: I think it is included under the second head; but almost everything that comes under the second bears on the first. Supposing the returns of a Company had been better because the Directors had not looked ahead, or had not regarded their responsibilities to the full—the result being that they had not kept their reservoirs, filter-beds, wells, mains, conduits, pipes, machinery, and plant in such a condition and state of repair as to bring them abreast of their present, and up to the performance of their future liabilities, and that there are liabilities or obligations which they are not performing, or which they will have to perform but are in a state of unreadiness for doing it—then the result, both in its effect on the "repute" price and also on the price a person going into the matter might be willing to give, is that the thing looks more prosperous than it really is.

The Chairman: You say "a person going into the matter." Do you mean a shareholder?

Witness: No; a man who says: "I will not take your word for the value of your undertaking, but will look at your books." The return on the books might have to be discounted if the Company have not kept themselves abreast of their liabilities.

Mr. Balfour Browne: Would an Arbitrator, without specific instructions, look into the question of future developments?

Witness: It is doubtful. Certainly not if he thought he had to take the "repute" price; and even if he thought he was entitled to look into it, he would probably do it only in a very modified way, being influenced by such arguments as: "The undertaking has got along in its present form all right in the past, and may be supposed to get along all right in the future." I think it right to instruct the Arbitrator to consider this matter. The instructions should clearly indicate to him the basis on which a fair and reasonable value is to be ascertained. As to the legal powers of the Company to take water, and the probability of those powers being limited, that looks to future prosperity; and however tightly a Company may have shut their eyes to future possibilities, the present returns are probably not lessened, but increased, by that blindness. Supposing that the Company will, in the near future, have to find resources more extensive and more difficult than those they have at present, I think it is right to consider that as a weight of responsibility pressing on the undertaking which, though it does not affect, or has not been allowed to affect, the present financial position, should be considered in estimating a fair and reasonable value on the basis I have indicated.

Without an instruction, do you think an Arbitrator would consider such a matter?—No; I do not.

Then as to legality of charges?—That is a matter that does not affect the "repute" price, but whether or not there is an excess of "abuse" price. The charges may have been made and acceded to; and a business Arbitrator might say: "These charges have been paid in the past; and I do not think the question of whether or not they are legal makes much difference." I do not think that is a ground on which the County Council should give an excess of price. The legality of the Company's charges would probably not be considered by an Arbitrator without special direction; and I feel sure that, instead of taking the charges at what they legally are, he would only make a small deduction for the rearrangement of those charges after legal decisions, instead of giving full effect to what the law lays down.

Is there any one of these conditions that would cut down the price below that which is fair and reasonable?—On the contrary, I think they indicate the fair and reasonable price at which the County Council should be allowed to take the Water Companies. With regard to these instructions, I would use the French word *préciser;* they fix the price—define it. Without directions, the Arbitrator would not be bound to consider the report of the Royal Commission as to the deficiency of certain of the Companies in the matter of filter-beds, storage reservoirs, and so on. The Arbitrator should know what the real legal position of the undertaking is, both as to duty and responsibility. He must assume that they will be carried out to the full. A "fair" price is that which a fully instructed mind would allow for it. The ordinary shareholder is not a person of fully instructed mind. A purchaser of shares, however well instructed he might be, might shut his eyes to the liabilities of the Companies, and give more than their value for the shares; but the County Council should not be asked to do this. I think it exceedingly doubtful whether, legally, the Arbitrator could take into consideration the possibility of a future water supply.

If he could not consider this, would the ratepayers of London have to pay too large a price for the undertaking?—They would, in my opinion. I think that probably the Arbitrator would take no heed of the statutory powers of other Companies to compete (say) in the district of the Lambeth Company.

Do you think it fair that the Arbitrator should take note of statutory powers?—Yes.

Mr. Littler, before commencing to cross-examine the witness, again expressed his regret at Members of Parliament being called to give expert evidence.

Mr. Balfour Browne pointed out that the witness was called at the request of the Committee.

The Chairman said the Committee had not asked Mr. Balfour Browne to call Mr. Fletcher Moulton or any Counsel, but only a witness who could throw light on the matter.

Cross-examined by Mr. Littler, witness said he did not think the words "fair and reasonable" were in the Lands Clauses Act; but the County Council were not asking to purchase under the terms of that Act. They wished to buy under special terms; and the justice or injustice of the proposal did not, to his mind, depend upon whether it was with or without precedent.

Mr. Littler: If either side tenders evidence, this should be considered; and if the Arbitrator rejects it, this is a ground for upsetting the award, is it not?

Witness: I think you are wrong in your law.

If an action is brought on an award, and the person objecting pleads that evidence has been improperly rejected, that is a good plea, is it not?—I think you will find that that is not the case. But a lawyer is not asked to give evidence upon a statute unless he has the statute before him. An Arbitrator can take the opinion of a Court as to what evidence he should admit; but I think the instructions in this clause would be as necessary to a Court as to the Arbitrator. They are here given to the Arbitrator as being the Court which has to decide the matter.

If there is any circumstance that depreciates the value of the property, ought not the Arbitrator to take it into consideration?—That depends upon what, in the mind of the Arbitrator, is the meaning of the words "fair and reasonable."

I object to those words altogether. They are not contained in the Lands Clauses Act. In that Act, the words are "value" and "as to compensation"?—The Arbitrator is bound to accept germane evidence.

He has to consider everything that the claimant says enhances the value of his property, and, on the other hand, everything that the purchaser says depreciates the value?—Yes; using "value" in the sense of that which he has to ascertain by the Lands Clauses Act.

Is not this the principle applied to every gas and water company since 1845?—I really cannot say. I believe that hitherto there has been no attempt to define the price at which public bodies should purchase these concerns.

Then the unhappy shareholder has to get less than he would by sale in the open market?—Very likely he has.

Mr. FEMBER: Imagine this clause stopping at the words "having regard to all the circumstances of the case." Would not an Arbitrator who meant to do his duty be bound to take into consideration every circumstance properly adduced before him as tending to enhance on the one hand or diminish on the other the present or prospective value of the undertaking?

Witness: Yes; defining the word "value" according to his notion of what he has to judge.

He is the judge, you know?—I think he ought not to be.

Then what is the use of putting him in the Bill?—He is to be an Arbitrator to find the *quantum* of something defined in the Bill. If you leave the clause in the vague form you suggest, he will have to define what is to be found under the Bill. As the clause is drawn, it defines his issue—the issue that he has to turn into money.

You turn him from an Arbitrator into a mere valuer?—Yes; he is a valuer. The Arbitrator and the Court should not be the judge of what value is. Parliament should define the principle on which the value is to be ascertained.

So that, generally speaking, the law of the land as to compulsory purchase is to be altered in its most essential feature (for the conditions under clause 6 are altogether outside the terms of the Lands Clauses Act) for the purpose of allowing the London County Council to get these undertakings cheaper than they otherwise would?—Whether the effect is to make the undertakings cheaper or dearer, the County Council ask to have the price so defined.

Would you think that the Arbitrator who took the "repute" value would be a good Arbitrator?—Well, he would be bound to act on what he considered to be the meaning of the clause.

Would you not think him an arrant fool?—That would depend upon circumstances. Remember many people would come before him to argue that the price should be estimated on the "repute" value.

Would an Arbitrator, having to determine the "fair and reasonable value of the undertaking, having regard to all the circumstances of the case," if he did not have regard to the circumstances mentioned in this clause, be, in your opinion, a wise man or a fool?—I should say that he had formed an erroneous judgment; but I should blame the ambiguity of the clause. With regard to the proposal to limit the right of the Companies to charge back dividends, I admit it is an alteration of the law, but it is part of the principle on which we think these undertakings should be valued.

In reply to Mr. BIDDER, witness said that if the Arbitrator decided that the price to be paid by the County Council was that which the undertakings would fetch in the market, he would exclude from consideration most of the things which the promoters thought should be had regard to.

Mr. BIDDER: Have you any authority—can you mention any case—which justifies the suggestion that the Arbitrator under the Lands Clauses Act would be entitled to consider the market value?

Witness: There in no instance one way or the other. In cases under the Lands Clauses Act, the value in the market is continually put forward, and contended for by Counsel for the claimant, as being the deciding rule. The contention before this Committee against putting these instructions in the clause fully convinces me of the danger of omitting them.

In re-examination by Mr. BALFOUR BROWNE, witness said the promoters must not be accused of attempting to get the undertakings at an unfair price because they put in the clause words which they thought would secure that they would purchase at a fair and reasonable price. The strong opposition there was to defining the principle on which the value should be estimated showed that it was going to be contended that regard should not be had to the conditions laid down in the clause for fixing the price. The principle of instructing an Arbitrator was not unknown to Parliament. It was done in the Artizans' Dwellings Act, and in the measures bearing upon the question of "betterment."

At the conclusion of the examination of the witness, the room was cleared, and the Committee remained in private deliberation for some time. On the readmission of the public,

The CHAIRMAN said that, before taking evidence at the next sitting, the Committee would hear the arguments of Counsel in reference to the points dealt with by Mr. Fletcher Moulton.

The Committee then adjourned until the 12th inst.

Battle Gas Company.—The annual meeting of this Company was held last Wednesday. The accounts showed a balance of £868; and a dividend of 10 per cent. was declared. The gas and meter rental for the year amounted to £1154.

Carburetted Water-Gas Plant for Colchester.—The Colchester Gas Company have concluded a contract with the Economical Gas Apparatus Construction Company, Limited, for one of their No. 3 settings of water-gas plant. They have also closed with the Company for an oil-storage tank, tar-separator, and other parts of the apparatus which are necessary for a complete plant. The work is now in hand, and will be pushed to as early a completion as is consistent with good workmanship.

LEGAL INTELLIGENCE.

WORCESTERSHIRE QUARTER SESSIONS.

The Assessment of the Dudley Gas-Works.

The appeal by the Dudley Gas Company against the assessment of their works by the Assessment Committee of the Dudley Union, the result of which was briefly recorded in the JOURNAL last week (p. 1203), had occupied the Justices at the Worcestershire Quarter Sessions at intervals from the 9th of April; the case being very stubbornly fought, though with perfect good humour, on both sides. The rateable value had been raised from £3842, at which it was fixed in 1881, to £4400.

Mr. HUGO YOUNG and Mr. G. MILWARD appeared for the appellants; Mr. ALFRED YOUNG and Mr. VACHELL represented the respondents.

The case having been opened by Mr. Hugo Young, the Company's Auditor (Mr. A. H. Gibson) was called. He put in a valuation based on the accounts for the year 1893, and said that in this year the coal strike caused a loss of £1500 to the Company; and the sales of gas were 5 million cubic feet less than they were in 1892, owing to the exceptionally fine weather. The receipts (£21,556) were accepted by the respondents. The working expenditure claimed, exclusive of landlord's maintenance and local rates, was £14,451, from which the respondents made the following deductions: Directors' fees, £300; bank charges, discounts, &c., £29; and the loss caused by the strike, £1500. Mr. Gibson's tenant's capital was £14,831; that of the respondents, £8586—the chief differences being the present value of the meters, £3600 or £3100; tools, furniture, &c., £1192 or £600; quarter's rent, £1128 or *nil*. The working capital (excess of payments over receipts to the middle of May) was £4418; and the stock of coal, £1746—total, £6164. For these two items the respondents allowed £3400. Public lamps, put at £1457, the respondents contended were landlord's and not tenant's plant. The tenant's share claimed by Mr. Gibson was £2595, or 17½ per cent. on the whole of the capital. The respondents allowed £1074; being 15 per cent. on the meters, stoves, and chattels, and 10 per cent. on the working capital and stores. Mr. Gibson admitted that the average annual expenditure on maintenance from 1881 to 1893—£1653—included the renewals of the whole of the plant, except gasholders, tanks, and buildings; and for the latter he claimed a renewal fund of £552, which was based on an average life of 34 years. The respondents allowed for maintenance and renewals £1800, which was confirmed by Mr. Gibson's basis, if the lives of the gasholders were put at 40 years, and those of the columns, tanks, and buildings at 100 years. Deducting the local rates left Mr. Gibson's rateable value of the whole at £1758; and that of the part in the town of Dudley at £1685. The respondents' rateable value of the whole, on the accounts for 1893, was £4618; and in the town of Dudley, £4545. In the course of cross-examination by Mr. Alfred Young, Mr. Gibson admitted that the maximum dividends authorized by the Company's Act had been paid since 1875, and that from 1886, when the last addition was made to the capital account, these amounted to £5900 a year; that from 1887 to 1892 the profits made in excess of the authorized dividends were £5023, which the loss through the strike in 1893 reduced to £3721; and that the selling prices of gas were reduced in 1889. Application was then made by Mr. Alfred Young for the receipts and expenditure on revenue account in 1892; but Mr. Hugo Young objected. After a long argument, the Court held the accounts of 1892 to be admissible evidence, but offered to state a case for the High Court on the point.

The hearing was then adjourned.

The proceedings were resumed on the 28th ult., when Mr. Gibson was recalled, and further examined. He stated that the profits of 1880—the year preceding the making of the rate—were £5913. The average profits from 1880 to 1893 were £5833; the profits of 1893, upon which the new rate was made, being £4609. Since 1881 the undertaking had been considerably extended and developed; and it required more capital to work it. In cross-examination by Mr. A. Young, witness said that £5900 had been divided among the shareholders. In 1892, they had £5023 in hand, which in 1893 was reduced to £3221; the profits, in consequence of the coal strike, having amounted to only £4600—£1300 short of the amount of dividends. Mr. T. E. Stillard, who had been Secretary of the Company since 1887, gave evidence as to the various items in the valuation of Mr. Gibson, put in on the previous occasion. Mr. A. Smith (Birmingham), Consulting Engineer to the Earl of Dudley, said the works were erected in an old mining district, and directly over a railway tunnel and the workings of a mine. It was a place very difficult to build upon; and already there were evidences of damage to buildings by the vibration of trains. The gasholders would have to be renewed in 34 years. Mr. Smith was cross-examined by Mr. A. Young to show that the foundations of the tanks were taken through the workings of the mine, and a good foundation obtained. With this he in part agreed; but he held to his opinion that the life of the tank should be put at 34 years. Mr. A. Young then addressed the Court for the respondents; and the hearing was again adjourned.

When the proceedings were resumed on the following day, the Chairman (Mr. R. H. Amphlett) said the Magistrates were of opinion that the appellants had worked out the rateable value on the proper basis. Of course, it was open to the respondents to reduce these figures; but, in ascertaining the net rateable value, the Court would work on the table submitted by the appellants. Mr. A. Young said that practically both sides agreed as to the basis of calculation. Mr. W. A. Mason (Messrs. Hedley, Mason, and Hedley, of Birmingham and Westminster) then put in his valuation for the respondents—his estimates and allowances being summarized with those of Mr. Gibson given above; and he put in tables, compiled from the books of the Company, in support of his conclusions. According to his calculations, the rateable value should be £5074. His cross-examination was not completed when the Court rose.

Before proceeding with the evidence on the 30th ult., the Chairman said the minds of the Bench were quite open—so open, indeed, that, having spoken to his brother Magistrates, it was impossible for him to

say which way the appeal would turn; their decision depending on several considerations as to which they had not yet arrived at any conclusion. The first question was that of the fee of £300 paid to the Directors, which was a question of fact in which another Court was not likely to alter the decision of the Magistrates. Another matter was the loss of £1500 occasioned by the strike. This might be a matter of law. Then there was the extremely doubtful question of the allowances to be made for tenant's capital. So far as he was able to come to any conclusion, there had been a practice, though not perhaps a universal one, of allowing 17½ per cent.; but, on the other hand, it was clear the Court had a right to make the allowance on what scale they pleased. It might be that the Court would not agree to any such deduction. He suggested that the parties should come to some agreement on these amounts. Counsel then consulted; and it was agreed that the rateable value should be reduced from £4400 to £4200, and that it should not be increased until there was some substantial addition to the hereditament by the raising and expenditure of further capital—each side to pay their own costs. The Chairman remarked that the Magistrates considered the settlement a very proper one; and he gave judgment accordingly.

Stealing Gas at Ilkeston.

At the Ilkeston Petty Sessions, before Mr. Alderman F. Sudbury and Mr. J. Ball, J.P., Henry Blundell was recently brought up and charged with having made a connection with a pipe belonging to the Gas Department of the Ilkeston Corporation, without having first obtained the consent of their Manager (Mr. F. C. Humphrys). As the defendant pleaded "Guilty," it was only necessary to explain that an india-rubber pipe had been attached to a service-pipe from which the meter had been removed by the officers of the Gas Department, and gas obtained. By means of a meter and some lead piping produced in Court by Mr. Humphrys, the usual practice followed when gas is cut off was made clear to the Bench; and a fine of £1, with 16s. 6d. costs, was inflicted.

Proposed Electric Lighting for Middlesbrough.—A meeting of the Electric Lighting Committee of the Middlesbrough Corporation was held last Wednesday to consider the question of an electric lighting installation for the town. It was stated that the cost would be 50 per cent. more than that of gas; but this would be counterbalanced by the improvement in the illuminating power. It was agreed to recommend the Council to adopt the electric light. It was stated that works costing £25,000 would be sufficient for present requirements.

Water-Works Extension at Halifax.—Bradshaw, which some three years ago was included in the borough of Halifax, has already benefited considerably by the amalgamation. The street lighting has been greatly improved; and now the Corporation have provided the inhabitants with an adequate and convenient supply of pure water. For the service of the district, a reservoir has been constructed at Ogden Kirk, with a capacity of 250,000 gallons; and this, with the necessary distribution-pipes, has cost £3000. The scheme is the work of the Corporation Water Engineer (Mr. James A. Paskin).

Further Deficiency in the Finances of the Salford Corporation.—The Town Council of Salford met specially a few days since for the purpose of levying the rates for the ensuing year; and, in the course of the discussion, Mr. Snape elicited from the Chairman of the Finance Committee (Mr. Mansfield) that, whereas at the previous meeting of the Council it was estimated that the deficiency in the finances was £24,000, it had been discovered that the actual amount was £34,000. However, the accounts of the Gas Department had been made up; and it was found, said Mr. Mansfield, that there was a considerable extra profit—about £11,000—of which the Committee had handed over £7800, which to a great extent would meet the additional deficit.

The Bolton Corporation and Gas Discounts.—At the monthly meeting of the Bolton Town Council on the 5th inst., a short discussion took place with regard to gas discounts. The minutes of the Gas Committee contained a resolution to the effect that certain applications for the allowance of discount lost through non-payment of accounts in due time be not acceded to. Mr. Lythgoe, who called attention to the matter, suggested that, where failure to pay was simply due to an oversight, the full penalty should not be enforced, but only half He believed this would be approved of by the ratepayers; and he asked the Chairman to accept a friendly amendment referring the matter back for further consideration. Alderman Miles, the Chairman of the Gas Committee, said he could not accept this as a friendly amendment. The practice had been in vogue for years in the Water and Gas Departments; and had worked well. They treated everybody alike. If it were the Mayor himself, or the Chairman of the Committee, who failed to pay within the 21 days, the discount would be forfeited. The amendment was not pressed, and the minutes were confirmed. Like a great many other Corporations, Bolton allows consumers of gas a discount of 6d. per 1000 cubic feet if the account is paid within 21 days from delivery; and the rule as to forfeiture is strictly enforced. The date of delivery and the last day for payment are clearly set forth on the face of the account; and unless the amount is paid in the given time, the discount is lost. A cheque posted on the last day, and reaching the offices of the department the following morning, will not be accepted; and though from time to time endeavours have been made, in cases of clear oversight, to get an allowance at any rate, the Committee have held to the strict reading of the rule. The reason for this is obvious. Were they to depart from it once, it would be difficult to say where they must stop. There was a very hard case before the Committee a short time ago, in which there was clear evidence of forgetfulness on the part of a cashier; but the Committee could not see their way to depart from the rule. The loss of discount in that case made a large hole in a £100 note. Some years ago a member of the Council fought the Committee on a similar point; but the County Court Judge decided in favour of the Corporation.

MISCELLANEOUS NEWS.

PRESENTATION TO MR. HEPWORTH.

The handsome testimonial of which Mr. Hepworth was the recipient last Friday was in every respect worthy of the man and of the donors; and one is at a loss which to admire the more—the taste displayed in the selection of the gifts bestowed, or the happy expressions of the recipient under more than ordinarily trying circumstances. A large number of Mr. and Mrs. Hepworth's personal friends assembled to witness the presentation subscribed for by the townsfolk of Carlisle as a mark of the esteem in which the whole family were held after twenty-five years' residence in the city, and as some slight recognition of the many acts of kindness and thoughtfulness displayed by them towards all classes of the community. The presentation consisted of a silver tea and coffee service on a handsome silver tray suitably inscribed, a case of silver spoons, forks, &c., and an illuminated extract from the minutes of the Corporation expressive of their appreciation of Mr. Hepworth's services.

The Mayor in making the presentation, said they were there to do honour to a gentleman who had spent the best part of his life in assisting the Corporation; and he did not know of any official who had hitherto worked for the Corporation who was more worthy of having his services recognized than Mr. Hepworth. When Mr. Hepworth came among them, the gas-works were in a critical condition; and he had carried them on in a most efficient way during the period he had been with them. There were various reasons why the works had been a great success—the growth of the population, and the fact that Mr. Hepworth had been backed by a Committee who worked with him. If the profits to-day had been in the same proportion as in 1870, they would have been able to pay about £12,000 instead of £2000 or £3000 into the funds of the Urban Sanitary Authority. Nevertheless there was not a town in England in which gas was supplied more cheaply than in Carlisle—taking quality into consideration. They were also supplied with water more cheaply. As to the water question, the Committee would have liked to have more fully developed their works; and in that they would have been ably backed up by their late Manager. But the inhabitants of Carlisle did not rise to the occasion; and the Committee had therefore to let the matter stand over in the meantime. It gave him great pleasure to present to Mr. Hepworth the testimonial subscribed for by so many of the inhabitants; and he hoped that both Mr. and Mrs. Hepworth might be long spared to enjoy the use of it. It would show to his posterity that Mr. Hepworth had made his mark in the gas world, and had during a quarter of a century served the city of Carlisle truly and well.

Mr. Richard Forster, the Chairman of the Gas Committee for 24 years, bore testimony to the services rendered by Mr. Hepworth, and expressed good wishes for Mr. and Mrs. Hepworth's future.

Mr. Gully, Q.C., M.P., said he was glad to have an opportunity of stating that he concurred in everything that had been said in regard to Mr. Hepworth, and of expressing his very sincere good wishes for Mr. Hepworth's prosperity in his future life. No one could have been in Carlisle much in the course of the last ten years without hearing of Mr. Hepworth; and indeed his name and fame as a gas engineer were great all over England. When he was President of The Gas Institute he greatly distinguished himself; and he was looked upon now not only in Carlisle and among gas authorities, but also in committee-rooms of a House of which he (the Speaker) had some acquaintance, as being a very great authority; and he was glad to hear, for the sake of those who had to deal with Gas Bills in that House, that they were not to be deprived of Mr. Hepworth's assistance in the future. He could speak with some experience of Mr. Hepworth's capacity for assisting justice; for he had the pleasure of cross-examining him on one occasion. The verdict went against the side on which Mr. Hepworth gave evidence—at which he (the Speaker) was, of course, pleased. But he found Mr. Hepworth a formidable gentleman to deal with; and if he had had a better case, he might have made the worse appear the better cause. He had no doubt that whatever work Mr. Hepworth might in future be engaged in, he would always act with that thorough knowledge of his professional business and with that straightforwardness for which he had been so long well known in Carlisle.

Mr. Creighton said that, having been twenty-one years a pupil of Mr. Hepworth's at the gas-works, he should like to testify to the respect he had for his master. Mr. Hepworth treated them well at the gas-works, and kept them very obedient; and he always acted in an honourable way towards his Committee. During the twenty-one years he had had to do with Mr. Hepworth he had come to the conclusion that no town in England had had a more valuable or trustworthy official than they possessed in Mr. Hepworth; and he thought that the very least they could do for him was to send him away with this testimonial of respect and esteem. It was a great honour to Mr. Hepworth to have been chosen to occupy a very important position in Scotland, with branches almost over the whole inhabited globe; and that he should have been chosen for such a high position without any asking on his part proved that his name had gone farther abroad than the district of which Carlisle was the centre. He felt that, in Mr. Hepworth's leaving, he and many others had lost a personal friend; and they were sorry to lose not only him, but his wife and charming family. He hoped that in his future life Mr. Hepworth would always keep a small touch of affection for the town he had so faithfully served during the last twenty-five years.

Mr. Hepworth expressed his pleasure at finding this occasion honoured by the presence of such a distinguished company as he saw before him; and he thanked the Mayor and Committee, the Town Clerk, and all those who had been associated with them in getting up the testimonial, for the high compliment which, through them, had been paid him by the members of the Corporation and the citizens of Carlisle, and others. Twenty-five years was a long time in a man's life, and during that period, so far as the corporate body of Carlisle was concerned, great changes had been effected. The town of Carlisle, however, had always had able men to serve it in its Council; and he

believed it would always have them. The witness of the public service rendered by those he had referred to was in evidence on every side; and that Carlisle would always be a progressive and prosperous town, he himself at all events did not doubt. In its Council and in its officials, he trusted it would continue to be represented by those who would ever act up to the city's motto, "Be Just and Fear Not," and who would never, by one single action, dare to be unjust and fear not. Of such a city, governed in such a spirit, it had been his pride for 25 years to be a citizen. He had endeavoured not only to possess himself of the privileges of such citizenship, but to take some share in the duties and responsibilities which citizenship entailed. He must not forget the testimonial which he saw before him had been presented in acknowledgment of his services as Gas and Water Engineer. Of the gas and water-works, he could naturally say a great deal; but he thought that that could be said, and must be said, if said at all, by others. If, however, others had nothing to say upon the subject, the gas and water-works were well able to speak for themselves. According to an analysis which he had just received of the work of the principal gas-works in this country during 1894, he was gratified to find that the Carlisle works were those from which the quantity of gas per ton of coal was higher than all others. He should value the testimonial just presented to him so long as he lived; and those who came after him would value it—not for the material worth which it embodied (although that, he knew, must be very considerable), but for the sentiments which it embodied.

Mr. FERGUSON, in proposing a vote of thanks to the Mayor for presiding, alluded to the valuable services which Mr. Hepworth had rendered to the City Literary and Scientific Society and other societies during his residence in Carlisle.

Mr. CHRISTIE seconded the motion; saying that, during the 25 years that Mr. Hepworth had been in Carlisle, he had given great assistance to religious effort.

The MAYOR acknowledged the vote; and a very pleasing function was brought to a close.

RAMSGATE CORPORATION GAS AND WATER SUPPLY.

The Past Year's Working.

At the Meeting of the Ramsgate Corporation last Thursday, the Chairman of the Gas and Water Committee (Mr. Chas. J. Gwyn, J.P., the Mayor) presented his report on the working of the gas and water undertakings, which are under the supervision of Mr. W. A. Valon, in the year endlng March 31 last. Beginning with the gas undertaking, he stated that the gross profit realized—viz., £11,805—was the largest that had been made since the Corporation had possessed the gas-works, and was an increase of £1814 on the figures for 1893-4. After paying interest and other charges, there would be a very handsome net profit of £6532, or £1983 more than in the previous year. Going into detail, he stated that the extra expenditure for coal, to earn the increased rental, amounted to £628; while wages had risen from £1675 to £1852. The repair and maintenance of the works had also entailed additional expense—the amount rising from £2479 to £2568; but this covered the £114 for a new exhauster at the commencement of the year, which was paid for out of revenue, instead of being charged, as it might have been, to capital. These amounts, together with salaries, purifying materials, &c., came to £16,248, as compared with £15,396. With regard to distribution, public lamps, accountant, clerks, &c., there had been expended £3430, as against £3593 in the previous year. The sale of gas, including the public lighting, yielded £23,908, to which was to be added £747 for rental of meters, and £6785 from the residual products. These items, including the service-laying account of £43, made a total of £31,484, as compared with £28,981 in the year 1893-4, or an increase of £2503. This showed that for the £628 extra paid for coal, added to £177, the wages and gratuities at the works, they had an increased revenue of £2503. To put the matter shortly, the total expenditure was £689 more (the coal having cost £628 of this amount); and it had produced altogether £1975 of rental—showing that the works and mains were in a good sound condition. The average production of gas per ton of coal was 10,700 cubic feet. Out of the net profit, the Committee recommended that £3266 should be handed over in relief of the district rate, and that £313 should be added to the depreciation fund, to raise it to £5000. In concluding this part of his report, Mr. Gwyn mentioned that the Committee further recommended that the price of gas to ordinary consumers should be reduced to 2s. 8d. per 1000 cubic feet as from the 31st of March last, and the charge for gas supplied to prepayment consumers to 3s. 4d. per 1000 cubic feet as from that date. With regard to the Water Department, taking the revenue account, he stated that the gross profit for the year amounted, after placing £500 to the depreciation fund, to £4699, or £252 less than in the preceding year. The gross income from the sale of water was £34 less than before. The expenditure for maintenance was about the same—in fact, a trifle less. The only item requiring mention was the one for fuel. Under this head there had been spent £274 more than in 1893-4. This was satisfactorily accounted for by the fact that the Committee had not charged anything for fuel for the extra pumping rendered necessary by the extension of certain headings; the Committee thinking it better to place this to the revenue rather than to the capital account. The net result of the year's working, therefore, was that, after paying interest on loans, income-tax, and sinking fund, amounting to £4487, the profit for the year was £712. Out of this it was proposed by the Committee to place £500 to the depreciation fund; leaving the net profit £212, as compared with £453 last year. As to the capital account, the £5000 sanctioned had been raised and added to it; part being used for the extension of headings. The balance of profit—viz., £890—the Committee proposed should be handed over in relief of the next district rate. This sum, added to £3266 from the Gas Department, would make a total of £4156, which was equal to a rate of 9d. in the pound.

LANCASTER CORPORATION GAS AND WATER DEPARTMENTS.

Annual Financial Statements.

At the last Monthly Meeting of the Lancaster Town Council, the accounts of the Gas and Water Departments for the year ending March 25, with report by the Gas Engineer (Mr. Charles Armitage), were submitted.

The Borough Accountant reported with reference to the gas undertaking that the receipts from the sale of gas, amounting to £19,189, showed an increase of £2337, while the sale of residuals produced £7238—a decrease of £221. The net profit for the year was £4550, compared with £930 in 1893-4, and £1538 in the twelve months ending June 30, 1892. The Borough Accountant also stated that the debit balance on renewal fund had been transferred to capital, and the renewal fund account closed. During the year, £697 had been expended on new mains and services; this sum being charged direct to revenue account. The reserve fund had a credit balance of £7777; and the balance in hand on capital account was £1526. Mr. Armitage's report contained further information in regard to the above and other matters. He mentioned that the total receipts on revenue account were £27,165; and the expenditure, including £697 for new mains, &c., £17,393—leaving a gross profit of £9772. The balance of net revenue was £4550, after providing for the following: Interest on stock and mortgage, £4267; interest on reserve fund, £244; sinking fund, £511; and income-tax, £198. As to the abolition of the renewal fund, the debit balance transferred to capital account was £6704. The reserve fund amounted to £7777. The Council, however, resolved on the 1st inst. that the net balance on the year's working—*minus* £1000 in aid of the rates—should be added to this fund and invested. It would, the report said, then amount to £11,327; and the interest would accrue until £12,000 (the maximum) was accumulated, after which the interest would become a source of revenue. The sinking fund, amounting to £7131, had been transferred to capital account, and absorbed for repayment of debt. This fund would again come into existence next year in accordance with a scale of payment prepared by the Borough Accountant to meet the altered condition of the capital debt. Mr. Armitage appended an analysis showing the cost of production, &c., as follows: The net cost of gas was 1s. 2·61d.; interest on stock and mortgages, 6·89d.; sinking fund, 0·84d.; reserve fund, 0·39d.; net profit, 7·36d.—the average price realized per 1000 cubic feet sold being 2s. 6·09d. The net profit in the previous year was 1·58d. per 1000 cubic feet of gas sold, with an average price of 2s. 3·82d. The additional receipt of 2·27d. was due to the increased price of gas, extending over the whole year, whereas the extra price only affected one quarter of the preceding year. The advance in the net profit was due to the increased price, amounting to the sum of £1855, and to the decreased net cost, which was abnormally affected in 1893 by the great coal strike and the erection of a new bench of retorts, which was charged to revenue account direct. The average cost of coal and cannel was 13s. 0·09d. per ton. Coke had contributed 4s. 11·77d.; and products from tar and ammoniacal liquor, 4s. 1·54d.—making a return for residuals of 9s. 1·31d., or 70·03 per cent. of the cost of coal, being an increase of 6·24 per cent. on the previous year. The prices of tar products had not improved since the last report, with the exception of pitch, which was, Mr. Armitage said, in good demand at an improved price. Sulphate had suffered a loss of £4 per ton during the last twelve months, and was now quoted at £10 per ton. A working statement showed that the consumption of gas during the last twelve months was 148,400,000 cubic feet—an increase of 7,985,000 feet, or 5·68 per cent. This increase was due to the larger number of customers for all purposes, and to the very severe weather last winter.

Mr. N. W. HELME, in moving the confirmation of the minutes of the Gas Committee, said it would be a matter of considerable interest to the Council to note that the annual report on the year's working showed a net profit of £4550. The amount available as net profit was so much in excess of last year that it was satisfactory to find it was made partly from the continued development and increased profits on ordinary business. The price of gas was raised some time ago on account of the advanced price of coal; and the requirements of the Finance Committee in respect to the altered conditions of the capital debt required them to hold their hands in regard to the reduction of the price as promised at the time of the increase. The Committee had not yet received a definite communication from the Finance Committee as to the annual amount to be put aside for the sinking fund. He might say, however, that, owing to the addition of 33⅓ per cent. to the irredeemable stock, £112·7 would be required in addition to the sum stipulated in the years gone by as payable under the old sinking fund arrangements. The increased capital to redeem in the future was £134,932. The original purchase of the gas undertaking cost £87,000; and further expenditure on capital account brought up the total to £106,769, including the amount paid for land in recent years. They had, however, the satisfaction of knowing that they had a thoroughly valuable and well-worked concern. The profits of the year just ended had exceeded those of any previous year; the highest amount they ever had previously being £3174 in 1884. With this large amount of profit, the Committee thought possibly it might be an opportunity of helping one of the most valuable institutions in the town, if it could be done legally; and they suggested that the Finance Committee should consider the desirability of putting aside £500 for the purchase of new books for the Free Library, which was one of the most desirable institutions in the town. Whether this could be done was a legal question, which was being considered by the Town Clerk. The question of the future price of gas remained for further consideration when they heard what amount had to be set aside annually for the sinking fund. There were one or two other matters with which the Committee were anxious to deal. If the Lighting Committee were desirous of continuing the expenditure of money in providing additional light throughout the town, the Gas Committee would look very favourably upon the matter, and were prepared to make concessions in regard to price for that purpose. They would willingly reduce the price 3d. per 1000 cubic feet. A great deal had been said about the quality of the gas, and the Committee had decided that they would spend more money in cannel,

so that the illuminating power might be improved to the utmost possible extent within their power.

Mr. BOWNESS seconded the motion. He remarked that it was not satisfactory to him that they had not carried out their promise to reduce the price of gas. In his opinion, they ought to lower the price, because a reduced charge always tended to increased consumption, and increased consumption made the production cheaper with the present plant. Therefore it was only wisdom to reduce the price; and he would have done it this year.

The minutes were adopted.

Regarding the accounts of the Water Department, the income amounted to £12,550, as compared with £11,702 in 1893-4. The expenditure was £8120, as against £7319. During the year, the maintenance of mains and services had cost £359, and the extension of mains and services, £639 more than in the previous year. The renewal and reserve funds had credit balances of £6968 and £4254 respectively. The Committee had resolved that the balance of £6968 at the credit of the renewal fund, together with the sum of £777 out of the profits on the past year's working, be added to the amount of £4254 at present standing to the credit of the reserve fund, making it £12,000; and that the balance of £1152 of the profits be transferred to the borough fund.

Alderman HUNTINGTON, in moving the confirmation of the minutes, said the water sold had produced £1044 more than in the previous year; but the profits were only £46 higher. There had been an increase in the expenditure on mains—the amount being £830, as against £190—and it would be found, in closing the renewal fund, they had taken £2000 out of that fund to pay for mains. If, therefore, they had added the £2000 to the £830, it would have made a big hole in last year's profits; and there would not have been a great deal to devote to the borough fund. The Committee had decided to take the balance in hand on the renewal fund, and put it to the reserve fund, making it up to £12,000, and to transfer another £1152 to the borough fund. They had therefore given to the borough fund this year £3652. He could not go with the Committee in what they resolved to do. They had been saving up a renewal fund for the extension of the mains in the town, awaiting the completion of plans of the whole water supply system and the confirmation of the Provisional Order for carrying out the extension. It was proposed to take £6000 out of this fund to relay the main from the Borough boundary to St. John's Church. This would have to come now out of capital or revenue; and if it came out of revenue, there would not be much for the borough fund out of the Water Department.

Alderman KITCHEN seconded the motion, which was carried.

BIRKENHEAD CORPORATION GAS AND WATER SUPPLY.

In moving the confirmation of the proceedings of the Gas and Water Committee at the meeting of the Birkenhead Town Council last Wednesday, Alderman Bloor said he was pleased to say that the accounts had quite come up to expectation; and the Committee would have pleasure in handing over to the Finance Committee the sum of £8651 as the profit for the year. So exceptionally prosperous had been the gas undertaking, that he thought it almost a record year. The total profit was something above £18,000. They were not able to give so glowing an account of the finances of the Water Department. The expenditure had been exceptional; and the profits had not been quite up to the usual standard. To complete the budget of good news, he thought that, from the tenders they had received, in all probability it might be in the power of the Committee to reduce the price of gas. The Committee, he also stated, had passed a resolution, recommending that the penny-in-the-slot meter system be introduced into the town. They had had this subject under consideration some time; but they had delayed moving in the matter, because they had not discovered a meter that was perfectly satisfactory. In the meantime, however, experiments had been tried in various parts of the country, with gratifying results. The object of the Committee was to popularize the use of gas among cottagers; and they intended to lay on the supply and allow the use of the meter free. It was also proposed not to make any charge in future for gas-meters, which would represent a gift to the gas consumers of something like £850 per annum. With regard to the waterworks, Alderman Bloor remarked that the Committee had resolved to continue the sinking of the borehole at the Ford, for a further depth of 500 feet. He was sorry to say that the operations of the Committee in their search for water had not met with the result looked for. The original contract had been to sink a borehole 500 feet in depth, at which they expected to procure an ample supply of water. At that depth, they could only get 10,000 gallons per hour, which was very inadequate. They had gone another 100 feet, with the result of an increase of 6000 gallons per hour; and they were now face to face with the question of either going further or abandoning the works. He was not in a position to commit his colleagues; but he thought they would take the former course. In answer to questions, Alderman Bloor said the cost of driving the borehole from 500 to 600 feet had been £225, and to carry it an additional 100 feet would cost £350. They had now got into the red sandstone, which yielded more freely; but still not in anything like an adequate fashion. The proceedings were confirmed.

Excessive Consumption of Water in the Outlying Townships of Dublin.—The Dublin Corporation Water-Works Committee appear to have a just cause of complaint against the out-lying townships respecting the wasteful consumption of water. From a return which was laid before the Committee at their last meeting, it is seen that during the week ending May 22, the average consumption per day in excess of the parliamentary allowance in the townships named was as follows: Blackrock, 208,551 gallons per day; Clontarf, 62,988 gallons; Kingstown, 257,903 gallons; Bray, 245,140 gallons; and Dalkey, 49,566 gallons. The consumption in Blackrock was at the rate of 45·2 gallons per head per day; in Clontarf, 31·7 gallons; in Kingstown, 35·2 gallons; in Bray, 55 gallons; in Dalkey, 33·5 gallons. The statutable allowance is 20 gallons per head per day.

NEATH CORPORATION GAS SUPPLY.

A Satisfactory Report—Reduction in Price.

At the Monthly Meeting of the Neath Town Council last week, the Gas Committee submitted their annual report and balance-sheet. These showed that out of the original cost of £58,500 there had been repaid off the loan £32,000 odd. There was a satisfactory increase shown in the consumption of gas during the year. Of the balance on the profit and loss account, it was recommended that £200 be placed to depreciation account, £600 to the repayment of loans, and to carry £2371 to next account. As there was an increased consumption of gas, it was recommended that there should be a reduction in the price to consumers of 2d. per 1000 cubic feet—viz., from 3s. 4d. to 3s. 2d. Mr. E. Davies moved the adoption of the minutes; and Alderman Davies seconded the motion. The Mayor (Mr. Hopkin Morgan), who opposed the proposal to reduce the price of gas, said he wished to explain his reasons for doing so. He did not think it desirable to take this course until they were in a position to make a considerable reduction in the calls of the ratepayers. The call amounted to an average of £100 a month; and it must be borne in mind that this amount came from the pockets of the ratepayers, and it was not fair to them to make this arrangement. If the prices of former years, when 5s. and 5s. 6d. were charged, were now imposed, there would be good reason to move for a reduction; but with the present price it would be unfair to non-consumers to make this annual reduction in the price of gas. Their average overdraft was £1300; and he failed to see the reason of making a present to gas consumers of £300, and only relieve non-consumers to the amount of £200. The works had cost the town £60,000; and this amount capitalized meant a payment of 4 per cent. interest, to be paid out of the rates. The Committee would not be able to commend this reduction but for this payment out of the ratepayers' pocket; and it would be well to bear in mind that they might expect an increase of rates by the formation of a School Board. He put it that it would be better to reduce the call on the overseers by retaining the money in hand; and they would act more wisely in reducing the overdraft than in giving this money away. They were departing from the policy pursued in dealing with the water undertaking; and, for the reasons he stated, he should vote against this part of the minutes. Alderman Charles endorsed the views of the Mayor; but Mr. Hopkin Jones supported the Committee. The gas-works, he said, had been made profitable by cheapening the price of gas, and so causing greater consumption. Alderman Davies concurred with the last speaker that the policy of the Committee was a wise one. Mr. E. Davies said it was well known that the Corporation had no capital to carry on the works, and that was the reason of the overdraft. For every penny due to the bank, there was more than sufficient to cover the amount due from gas consumers. Mr. Glass said, as a large consumer, he would welcome the reduction in price; but he did not see his way clear, with the large overdraft, to support the proposal. The Town Clerk stated that there was due to the Council a sum which would leave a handsome balance after paying the overdraft. An effort had been made when the Council applied for the last Provisional Order, to get some capital for the gas-works; but the stipulation that it should be repaid in ten years prevented it being carried out. The Mayor moved an amendment that the £500 be applied to reducing the call on the Overseers. This, however, was lost, only three voting for it; and the minutes were then adopted.

WEST BROMWICH GAS SUPPLY.

At the Meeting of the West Bromwich Town Council last Wednesday—the Mayor (Alderman R. Farley) in the chair—the Gas Committee reported that the accounts for the financial year ending March 31 last, which have been noticed in the JOURNAL, had been duly passed by the Auditors, Messrs. Caldicott and Hill, of Birmingham. They went on to say that the question of making an installation of machinery for charging and drawing retorts had been under the consideration of the Committee for a considerable period; and as the regenerator furnaces were complete, the present was an opportune time for the adoption of mechanical stoking. The Manager had prepared an exhaustive report, showing the cost of the outlay, and the saving to be effected thereby. They therefore recommended the Council to sanction the acceptance of an estimate from West's Gas Improvement Company, Limited, for providing and fitting charging and drawing machinery, with steam-engines and coal-breakers, &c., according to the specification, for £1765, exclusive of foundations, which would be provided by the Corporation. The Manager's estimate of the cost of foundations, &c., was £235; making a total outlay of £2000. The Corporation had obtained the sanction of the Local Government Board to this outlay; and the money had been borrowed. The Mayor, in moving the adoption of the report, said the net profit from the gas undertaking amounted to £1351, which was a considerable improvement upon the previous year. This had been principally brought about by the reduced price of coal, which was less by £1729. He was sorry to state that none of the profit would be handed over in relief of the rates, as it would be required to swell the amount of working capital, which at present amounted to £9983. The Local Government Board would not allow the Corporation to borrow any money for this purpose; and therefore they were compelled to keep sufficient funds in hand. This was a disappointment to all who were interested in the gas-works, especially when they considered that for some time the Committee had not been able to contribute anything towards the reduction of the rates. He mentioned that for each of the first four years after the undertaking was acquired by the authorities—from 1880 to 1884—the Committee were enabled to hand over a sum of £3000 in aid of the rates. The works at that time were new; and this was a great advantage. In 1885, the amount was reduced to £1500; and from that date to 1888, the Committee were unable to give anything. In 1892, they were in a position to hand over £1000; but during the past three years, no benefit had been derived from the gas undertaking. He was pleased to state that, although the Committee had not been

able to assist the rates, yet during the coal strike they had supplied gas at a very cheap rate, which had proved beneficial to the whole of the tradesmen of the town. He referred to the system of mechanical stoking which it was proposed to adopt, and said it had been estimated that the saving by its introduction would be about £400 per annum. It would undoubtedly take the place of about eight men, which would be a great disadvantage; but, on the other hand, the cost of gas production would be less. Alderman Rollason seconded the motion. Mr. Pitt urged the Council to hesitate before they launched into such an expenditure as the one recommended. They had lately spent about £19,000 on the gas-works; and, so far, they had not reaped any benefit from it. Mr. Wilson said that, as business men, they ought to go in for the very latest improvements, as the Birmingham Corporation were putting in this kind of machinery at their Swan Village works. The report was ultimately approved; Mr. Pitt only voting against the motion. The Highway Committee reported that they had given instructions for incandescent burners to be fixed in all the large lamps in the borough which are supplied by meter.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Almost before this appears in print, the annual meeting of the Incorporated Gas Institute will have begun in Edinburgh. The latest intelligence I have on the subject is that everything is in perfect readiness for the gathering. The programme has been published and commented upon; but the other arrangements have not been so well advertised. For the smoking concert on Wednesday night, for instance, some of the best talent which the city can produce has been secured; and a great treat may be expected. Then for the reception and dance on the Tuesday night, arrangements, I understand, are being made to provide a high-class musical entertainment for those who do not care to dance. Members who may not be accompanied by ladies need have no fear of not finding partners for the dance, as, according to custom, a numerous contingent of the fairest and most cultured of the young ladies of the city will be on invitation. The excursion on Friday will, if favoured with good weather, be the most popular function of the meeting. The tickets for it are going off rapidly. Already Mr. F. G. Burfield, the Secretary, has taken up his quarters in the city; and other "lions" of the Institute have begun to put in an appearance. Altogether, a very successful gathering may be expected.

Speaking of the Institute meeting, brings to mind the succeeding meeting of the North British Association of Gas Managers, which is to be held at Melrose at the end of next month. The Committee have been recently to Melrose to make arrangements for the meeting; and an effort is to be made to produce the best programme possible. I hear that St. Mary's Loch is spoken of as the destination of the excursion on the second day, which would be quite an attraction.

A deputation of the Edinburgh and Leith Gas Commissioners have been in Liverpool, St. Helen's, London, and Belfast recently inspecting water-gas plant, with a view to reporting upon that system of gas making. They were in Belfast this week, where they were well pleased with what they saw. They were also, it goes without saying, courteously received at all the other places.

The accounts for the year ending April 30 of the Dundee Corporation Gas Department show an output of gas amounting to 495 million cubic feet, which is 18 million feet more than was estimated for. The quantity sold was 447 million cubic feet, or 16 million feet above the estimate. Unaccounted-for gas rose from nearly 39 to a little over 42 million cubic feet; the result doubtless of the severe frost of last winter. The percentage is 8·505, as against 8·143 reported a year ago. Bad trade has told severely upon Dundee. In the year preceding that just closed, there was a decreased consumption, as compared with the year before that, of 27 million cubic feet; so that there is still 9 million cubic feet to make up before the position of two years ago is reached. On account of the great drop a year ago, a very moderate estimate was adopted; and it has been exceeded. This seems to point to returning prosperity; and the Gas Committee, interpreting the situation in that way, have estimated for an output this year of 505 million cubic feet. Two years ago, the price of gas was reduced from 3s. 9d. to 3s. 4d. per 1000 cubic feet; and last year it was retained at 3s. 4d. The revenue from gas, which two years ago was £84,346, and last year was reported as £71,771, is now £74,203. As compared with the figures given a year ago, chemical products have realized £4963, as against £5613; coke £202, as against £101; and gas-stove rental £106, as against £108. The total revenue is £80,042, as against £78,061. For the current year, the estimate of revenue is £81,179. On the expenditure side, two years ago it was reported as £92,010, of which coal amounted to £40,080; a year ago it was £77,660, of which coal amounted to £36,101; and it is now reported as £80,173, of which coal amounted to £38,103—the rise in coal upon last year being no doubt due to the miners' strike. The other chief items of expenditure were: Purifying, £816; main-pipe repairs, £748; service-pipe repairs, £657; repairs on buildings, £1273; gas apparatus, tools, &c., £1435; retorts and setting, £1710; meter repairs, £1665; fuel, £333; refuse, £704; interest account, £6116; expense of loans, £100; annuities, £7296; assessments, £4495; rents, £283; salaries, £2765; general expenses, £855; coal analyses, £422; sinking fund, £7500; contingent fund, £500; and deficiency on electricity department, £2181. They were reported a year ago as follows: Purifying, £917; main-pipe repairs, £713; service-pipe repairs, £551; repairs on buildings, £1190; gas apparatus, tools, &c., £1232; retorts and setting, £2109; meter repairs, £1631; fuel, £554; refuse, £950; interest account, £6426; expense of loans, £100; annuities, £7356; assessments, £4934; rents, £357; salaries, £2815; general expenses, £594; coal analysis, £405; sinking fund, £7500; and contingent fund, £1000. During the past year, the capital expenditure amounted to £16,108, raising the capital account to £206,755. The sinking funds stand at £44,861. The estimates for the current year are framed to bring out a surplus of £396. A year ago the surplus estimated was £294. On the past year, there was a deficit of £131; but if the £2181 which has been applied to remove the deficiency in the electricity department had not required to be taken into account, there would have been a surplus of £1950. In the electricity department, the receipts rose from £2647 to £3693; and the expenditure, from £4532 to £5894—leaving, as above, a deficit of £2181. The deficiency estimated for was £320. For the current year, the estimates are framed to bring out a surplus of £13. It is recommended that the price of gas should be retained at 3s. 4d. per 1000 cubic feet; and that of electric current, at 5d. per unit. Taken all over, the outlook for the Gas Department in Dundee is decidedly hopeful. Mr. M'Crae has had to weather a period of commercial distress, in which the unsatisfactory features of forgery and bankruptcy have figured—not in his department by any means, but in the general community, and affecting the general business of the city—but he seems to be now getting into a more prosperous time.

There is not much demand for gas for ballooning purposes; but there are points in connection with the supply of it which it is better should be known. A litigation over the failure of a captive balloon entertainment, which was to have been one of the leading attractions at a carnival in Edinburgh last summer, was decided in the Court of Session yesterday. The carnival was open from Monday to Saturday; and the balloon was to be ready for "traffic" on Monday afternoon. When it and the men in charge arrived on the ground on the Monday, the Committee of Management declined to allow the balloon to be inflated, because they could not afford to allow the gas supply to be interfered with. The balloon, they said, must be inflated during the night, when the gas supply was free from other demands. It was not inflated that night, for some reason or another, and so the next day was lost. On Tuesday night it was inflated; but on Wednesday and Thursday there was a gale of wind, and voyaging could not be attempted. Thursday night was wet; and on Friday morning the balloon would not rise. The contract was thereupon cancelled by the Committee. The aeronaut claimed his remuneration, and laid the blame of the failure on the Committee. They, on the other hand, laid the responsibility upon him, and claimed from him a large sum in name of damages for breach of contract. The result is that the aeronaut has been held to have fulfilled his contract; and he has been allowed remuneration except for the Wednesday and Thursday, when the Committee were not to blame. The contract was that he was to provide the balloon, and the Committee were to supply the gas. They had led two 4-inch mains into the ground; and it was surely mismanagement to say that they would not have been able to have supplied gas during the day to the gas-engines and cooking-fires on the ground, as well as the balloon, when they had to do that in the evening, and also to furnish a good deal of gas for lighting. But the Committee also expected that the same gas which should have been put into the balloon on the Monday night would serve for the whole week. Their Lordships of the Court of Session would not admit that to be possible, when the continual waste that goes on, even with the most perfect of balloons, is taken into account. The cancelling of the contract was the greatest blunder the Committee were guilty of. They did not realize that, in consequence of the rain overnight, the texture of the balloon was so affected as to allow of a freer transfusion between the gas inside and the air outside, with the result that the buoyancy of the balloon was lessened. In this instance, there was no attempt to lay blame on the gas supply. It was, on the one hand, their own arrangements which the Committee thought were insufficient; and, on the other, they considered that the aeronaut did not do his duty. But it is conceivable that circumstances might arise in which the gas supply might be made the bone of contention; and it is as well to have on record a decision to the effect that a balloon ought to be used "immediately after it has been inflated with gas," because the gas rapidly loses its power of lifting, and particularly that after an inflated balloon is exposed to rain the gas very rapidly deteriorates, and cannot be held accountable for the loss of lifting power.

The deputation from the Arbroath Gas Corporation to Inverness visited that town on Tuesday, to inquire into the working of the chemical department of the gas-works there. They were met at the works by the Manager (Mr. J. Thomson), and by about half-a-dozen members of the Works Committee. A real Highland welcome was extended to the visitors. Not only was the plant and its working—which has always been a success—shown to them, but, after their business was over, they were entertained to a drive in the neighbourhood of the town. The deputation were highly pleased with the apparatus shown to them.

The proposal to increase by £100 the salary of Mr. J. Fleming, the Treasurer of the Glasgow Corporation Gas Department, which was made by the Gas Committee, came before the Town Council on Thursday. Opposition was offered to it on the ground that so long as men are employed by the Committee at weekly wages not exceeding 18s., and until the minimum wage be 21s., no increases should be given to the higher officials. The opposition was, however, talked over; and the increase was agreed to. Mr. Fleming passes about a million of money through his hands every year; and business in his department is growing rapidly. To be stingy to a man in his position, is not what could be expected from the Glasgow Corporation; but, of course, there is no corporation in the kingdom in which socialistic theorists will not spring up. The Corporation, on the same day, agreed to advance the salary of Mr. Arnot, the Electrical Engineer, by £100 a year, on the condition that he devote the whole of his time primarily to the electricity department, and that if his services be required by any other of the Committees of the Corporation, the Committee to whom his services may be given shall be charged for them.

A dispute has arisen between the Gas Department of the Glasgow Corporation and Messrs. John Paterson and Son, Limited, the contractors for the excavation for the tank of the large new gasholder at the Tradeston works. It is a somewhat peculiar difficulty. In the contract, the firm are required to lay by the material they remove from the excavation, and, after completing the tank, to use it in banking up outside the tank wall. They proceeded to lay it alongside the excavation; but part of it fell in, and the question arose as to where they were to put it—the space being limited. The contractors applied to the Gas Committee for instructions as to where they were to deposit the excavated material; and they were told, in effect, that this was for them to decide. The reading given to the contract by Messrs. Paterson and Son is that the Corporation are to provide

accommodation; and the Corporation take up the attitude that they came under no such obligation, but that, as the requirement is to lay the material aside and restore it, it is for the contractors to provide space to deposit it upon. The contractors say they cannot get ground for the purpose nearer than a mile and a half off; and if they are to be held to the view of the Corporation, they must be paid 1s. 1d. per cubic yard more for the excavation. Raised in that form, the question has been sent before Mr. W. R. Copeland, C.E., as Arbitrator.

The Dumfries Gas Commission on Thursday resolved to contract for 6100 tons of coal, at an average price of a small fraction over 10s. 11d. per ton. In the contract, there are included 4000 tons of splint, 500 tons of cannel, and the remainder pugs and whole seam. They also renewed their contract for oil at the same price as last year—£2 17s. 6d. per ton. The average price of the coal is a good deal less than last year. Notwithstanding that the Peebles oil-gas process is worked, one of the members complained of the quality of the gas, for which he was corrected by the remark that when the new purifiers were in working order that cause of complaint would be removed. The illuminating power of the gas is 28½ candles; so that it is apparent the enriching process is working satisfactorily, and if there be anything wrong with the quality of the gas it must be sought for in connection with some other part of the manufacturing plant. I suppose most will agree that the lack of purifier accommodation has little to do with what gas managers know as "smoky gas," which one gentleman complained of; but, of course, the remarks were made by Commissioners, and not by the Manager, and were for the "benefit" of the public.

An action of great local interest has been raised in the Sheriff Court at Castle Douglas, by the Castle Douglas Gas Company, against Mr. Thomson, the Provost of the place. The Company sue for £82 19s. 4d. for gas supplied between May 22 and Oct. 2, 1894. The defence is that the sum is an overcharge. It appears that in February, 1893, Provost Thomson disputed an account for £13 for the period from December to February; and his meter was then tested and found to be registering accurately. According to the Sale of Gas Act, he had to bear the cost of the meter inspection. He now declines, because of the cost of that inspection, to have his meter examined; and he relies upon his previous and succeeding accounts to establish his contention that there has been an overcharge. He puts forward the figures for the corresponding quarters as being: 1887, 4500 cubic feet; 1888, 4700 feet; 1890, 3000 feet; 1891, 5900 feet; 1892, 8100 feet; and 1893, 8000 feet. For the period in dispute—the lightest of the year—the quantity charged for is 26,900 cubic feet. From October to December succeeding, it was only 4400 cubic feet. For the Company, evidence was given by Mr. D. Paterson, Gas Meter Inspector, of Edinburgh, and Mr. G. Malam, Gas Manager at Dumfries, to the effect that a gas-meter which once registers more gas than is consumed will never return to a lower register until repaired. For the defence, the evidence was that no more burners were in use during the disputed period than in previous years, and no escapes or waste of gas were known of. The Sheriff said that, according to the number of burners and the time given, the quantity charged for should have been less than 5000 cubic feet. He took time to consider his judgment; and until the case is disposed of, no further comment can be made upon it.

The Town Council of Hamilton have again played see-saw over the subject of the erection of a new gasholder. Their first proposal was for one of 750,000 cubic feet capacity. Then that was delayed on a motion by one of the members in favour of erecting the new holder on a site two miles away from the works. The same gentleman proposed to reduce the size of the holder; and that having been accepted (for the reason that it would save £4500), the Commissioners, on the suggestion of the Gas Committee, gave up the distant site, and, as they had space within the works for the small holder, recommended its erection there. This was objected to by the same gentleman who had been instrumental in getting the size of the holder cut down, because it would be too close to his works. The Council sent the subject back to the Committee; and now the Committee have come up with a recommendation to place the holder at the other end of the works, and to revert to the large one. This has been agreed to. Time has been lost by the delay; and those who have been the cause of it have nothing to show for their action. The contracts have now been let. Messrs. J. Brown and Co. are to do the brick and concrete work; and the Barrowfield Iron-Works, Limited, are to furnish the extensions in the works and erect a new holder. Their offer for the small holder was £5030; and for the large holder, £7275. On Thursday night, the Town Council let contracts for extensions to the amount of over £12,000. They also settled their coal contracts for the year; taking 10,000 tons of low-class cannel, 500 tons of shale, 300 tons of splint, and 300 tons of whole seam.

The Largs Gas Company have paid a dividend for the past year at the rate of 6 per cent. The Company are introducing Hislop's patent regenerative system of firing into their works.

Sulphate of ammonia is reported as selling at £10 5s. per ton. At this time last year it was selling at from £14 to £14 5s. per ton.

At the present moment, the communities served with water by the Glasgow Corporation are consuming nearly four million gallons of water per day more than they did at the corresponding date last year. Fears are entertained that, unless this great excess can be brought down, there may be a water famine; and the public have been appealed to to endeavour to reduce the consumption. The Engineer thinks there may be many service-pipes which were burst by the frost of last winter, and have not yet been repaired; and he recommends a general inspection of all service-pipes.

The accounts of the Edinburgh and District Water Trust for the past year show an actual revenue of £89,783, which is £1972 over the estimate. The expenditure amounted £15,315, which was £2524 under the estimate. The balance of profit is £4468. The revenue was £2545 more than in the preceding year, which was chiefly realized by the increased consumption for trade purposes; the amount received for those supplies having risen from £25,571 to £27,145.

The Mourne Scheme of the Belfast Water Commissioners.—The Belfast City and District Water Commissioners have agreed to accept the tender of Mr. Alexander Gawl for carrying out the work on No. 3 section of the Mourne water-supply scheme for the sum of £139,746.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 8.

Sulphate of Ammonia.—There has been a moderate business doing; and, notwithstanding that the holidays have intervened, the forces at work referred to in last report have resulted in a further slight advance. At the close, the market is fairly steady at £10 to £10 2s. 6d. per ton f.o.b. at the ports. Scotch makers have been offering ahead at a premium of about 10s. per ton; but other makers still decline to offer at the forward position.

Nitrate of Soda is firm at 8s. 3d. per cwt. on spot for fine quality.

LONDON, *June* 8.

Tar Products.—Benzols are in fair inquiry, at slightly improved values. Carbolic and cresylic acids and their collateral products are steady at former rates. Pitch keeps firm; but shipments are being seriously interfered with by the sunny weather. There is no new feature in common oils, which remain dull and difficult to sell. Creosote salts and all forms of naphthalene are wanted; and somewhat higher quotations are made in respect to them. Solvent naphtha is duller than is usual at this period of the year; and, so far, the market has been disappointing. Anthracene is steady. The following prices represent business during the past week: Tar, 18s. to 22s. Pitch, 33s. to 35s. 6d. Benzols, 90's, 1s.; 50's, 11d. Solvent naphtha, 1s. Toluol, 1s. Crude, 30 per cent. naphtha, 4¾d. Creosote, liquid, 1⅛d.; ordinary, 1d.; salts, 20s. Cresylic acid, white, 1s. 2d.; brown, 11d. Carbolic acid, 60's, 1s. 9d. Anthracene, "A," 1s. 1d.; "B," 9½d. to 10¼d.

Sulphate of Ammonia continues firm at the advanced price mentioned in last report; and considerable sales have been made during the week, according to port of shipment, at £9 17s. 6d. to £10, less 3½ per cent. Gas liquor is quoted at 7s. to 8s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past week, operations in the coal trade of this district have been altogether at a standstill, owing to the holidays; pits in the Manchester district closing from Tuesday last, and not getting into work again until about Wednesday in this week, whilst in other districts there have been more or less general stoppages to a similar extent. There is therefore little or nothing to report as regards trade; but it may be mentioned that, prior to the holidays, the settlement was made with regard to the important gas coal contract for the Manchester Corporation. At present I am only in possession of partial details; but I have been furnished with the names of half-a-dozen collieries in Lancashire who have booked close upon 100,000 tons at prices, I understand, ranging from 6s. 6d. per ton at the pit mouth for good screened Wigan four-feet up to 7s. and 7s. 3d. for the best Wigan Arley gas coal. As to other descriptions of round coal, prices remain nominally unchanged at about 10s. to 10s. 6d. per ton at the pit mouth for best Wigan Arley house coals; 8s. 6d. to 9s. for Pemberton four-feet and seconds Arley; 7s. 6d. to 8s. for common house coals; and about 6s. 6d. for steam and forge coals. Common steam coal for shipment is obtainable at as low as 7s. 3d. to 7s. 6d., and better qualities at about 7s. 9d. to 8s. per ton delivered at the Garston Docks or the High Level, Liverpool. The very restricted output of slack is necessarily tending to produce a scarcity of engine fuel; and for these, prices are beginning to show some upward move—a few of the collieries in the Wigan district having put up their rates 3d. per ton. So far, however, there is no actual general advance. At the pit mouth, common slack averages about 3s. to 3s. 6d. per ton; better qualities, 4s. 6d. to 4s. 9d.; with some of the special sorts quoted at from 5s. to 5s. 3d.

Northern Coal Trade.—There has been generally a better demand for coal in the last few days, not only because the holiday stoppage of production had lessened the stocks in hand, but also because the shipments of coals are much fuller, now that the whole of the northern ports are open. Hence, the work at the collieries has been fuller; and the general tone of the trade has been, on the whole, better. The improvement is perhaps more noticeable in the steam coal branch of the trade than in gas coal. Best Northumbrian steam coals are steady; and collieries quote from 8s. 9d. to 9s. per ton f.o.b., according to the length of turn on their order books. Second-class steam coals are comparatively weaker, at from 8s. to 8s. 6d. per ton; whilst steam smalls, being now a little more plentiful, are quoted at from 3s. 6d. to 3s. 9d. per ton. Manufacturing coal is quiet. Gas coal varies very greatly in price. For some contracts, the rate is put at about 6s. per ton f.o.b.; whilst for odd cargoes, as high as 7s. per ton has been asked and paid for special kinds. At present, the demand is only limited for gas coals, except where collieries have orders for shipment; and thus the work at many of the collieries is very short, though it is probable that in two or three weeks there will be some increase in the demand. In the coke trade, there is a slightly better demand; the opening of Baltic ports increasing the requirements of some shippers. The price is unchanged, at from 12s. 6d. to 13s. 6d. per ton f.o.b. There is no alteration in the price of gas coke; but with a limited production and a fair export, the stocks in some cases are being now reduced to small dimensions.

Scotch Coal Trade.—The trade continues dull; little change falling to be recorded. Steam, splint, and main coal show a very quiet market, with orders scarce and prices, if anything, easier. Ell of the best quality is still in better demand than other varieties. At present prices, only coalowners who possess the thicker seams are making any profit, and though miners' wages are very low, there is talk of a further reduction, which is expected to lead to trouble with them. A fall in wages can only, it is believed, be averted by a rise in prices; and of this there is at present no prospect. The prices quoted are: Main, 5s. 9d. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s. 3d.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. to 7s. 9d. Shipments for the week amounted to 134,754 tons—a decrease as compared with the preceding week of

13,690 tons, and as compared with the corresponding week of last year of 773 tons. For the year to date, the total shipments have amounted to 2,639,539 tons—a decrease on the same period of last year of 392,908 tons.

Malta and Mediterranean Gas Company, Limited.—In their report for the six months ending March 31 last, the Directors of this Company state that the result of the year's working has been satisfactory. There has been an increase in the gas-rental; and the revenue from residuals has been fairly maintained. The Directors recommend the required dividends upon the first and second preference capital, and a dividend of 4 per cent. upon the ordinary capital of the Company, which, with the interim dividend of 2 per cent. paid in December last, makes 6 per cent. for the year; leaving a balance of £2584 to be carried forward.

Grand Junction Water Company.—The report of the Directors of this Company for the half year ending March 31 has been issued; and it will be presented at the general meeting to-morrow. The Directors call attention to an entry of £8216 in the revenue account as special expenditure; and they explain that £1114 of it was the Company's proportion towards repairing damages caused by the heavy floods that took place in the Thames Valley last November—the main expenditure being in connection with the unprecedented frost of last February and March. They much regret the inconvenience to which some of the consumers were subjected, although every effort was made by the Engineer and his staff to mitigate it. The work of renewing and replacing injured mains is still going on; but the Directors are happy to say that the whole of the Company's district is in full possession of the normal supply of water. Referring to the action of the London County Council, the Directors point out that of the eight Bills introduced into Parliament by the Council, the only ones which have passed the second reading are those for the purchase of the Lambeth and the Southwark and Vauxhall Companies; and they assure the proprietors that all necessary measures have been taken to watch and safeguard their interests. A sum of £15,000 of debenture stock, at present within the powers of the Company to issue, has been sold by public tender at £133 per £100 of stock. Owing to the exceptional expenditure above referred to, the Directors are unable to recommend a higher dividend for the last financial half year than one at the rate of 7 per cent. per annum on the ordinary share capital, and on the "C" and "D" shares. The shareholders will be asked to confirm the resolution passed at the last half-yearly general meeting, increasing the remuneration of the Directors. They gratefully accept this mark of confidence; but they do not propose to avail themselves of the increased remuneration until they are in a position to advise the declaration of a higher dividend. The accounts accompanying the report show total receipts for the half year of £101,168, against £100,367 for the corresponding period of last year. The expenditure on maintenance was £31,612, in addition to the £8216 for special expenditure, against £29,712 last year. The cost of management was £8652, as compared with £8072. The amount carried to dividend and interest account is £46,186, against £55,582 last year.

Gas and Water Management at Knaresborough.—At the last monthly meeting of the Knaresborough District Council, the Gas and Water Engineer (Mr. T. Settle) presented his annual report on the gas undertaking. On the whole, it showed excellent work as compared with the previous year. There was an increased sale of gas to the extent of 642,300 cubic feet, with 152 tons less coal used; while a thorough overhaul of the public lamps has resulted in a saving of 400,000 cubic feet. In the retort-house, last winter's work was done with 11 retorts, 2 stokers, and a coal wheeler; whereas in 1893-4 there were 26 retorts in use, with 6 stokers to attend them. In the distribution, the unaccounted-for gas was brought down from 23·31 to 13·29 per cent. As to residuals, the returns were £13 18s. 3d. more than in the preceding year. Altogether, there was a saving of £255 as compared with the previous results, although increased labour had been required for carrying out the improvements. When this report came before the Council, it was accompanied by a recommendation by the Gas Committee that Mr. Settle should be granted the same privilege as the previous Manager to attend the meeting of The Gas Institute, for which £5 had been allowed. This daring proposition roused one of the councillors, who wanted to know what advantages would be gained by the Manager going to Edinburgh, and, if he did go, why they should pay his expenses. He moved that the money be not granted; and the motion was promptly seconded. Then came the Manager's turn. Mr. Settle told the Council plainly that he did not ask for the grant. There would, he said, be papers from the best engineers, and discussion among members upon technical subjects, two lectures, and other matters. If he went to Edinburgh, he should have to add another £5 out of his own pocket. If the Council thought it would be misspent money, he would rather not go. One councillor expressed the opinion that a man should pay his own expenses if he wanted to learn more. Mr. Horspool (we cannot refrain from naming him) said they ought to assist the Gas Manager in his duties all they could. If he went to Edinburgh, he would be among the best engineers of the country; and if the Council refused the £5, it began to look as if they were dissatisfied with what the Manager had done. The grant was given to the previous Manager; and now, when they had a much superior officer, they would not allow him the same privileges. Good words, Mr. Horspool; but of no avail. No money was granted. After this came a conversation as to printing Mr. Settle's report; but it was decided to wait and see how much the local paper gave of it, and then possibly get it printed "in an inexpensive manner." Mr. Settle is Manager of the water-works, at a small remuneration; and the next occupation of the Council was to "heckle" him on the subject of the old water-wheel. Mr. Settle, in reply to questions, said he could not put right all at once what had been going wrong for twenty or thirty years. He was sorry he ever knew the water-works; and he would resign the management of them, for he would only miss the work. A motion was then hastily made that the resignation be accepted. But an amendment to the contrary was carried by 13 votes to 3; and Mr. Settle retains his position, with all its honours and emoluments.

Halifax Corporation Gas Supply.—The operations of the Halifax Corporation Gas Department during the year ending March 31 resulted in a net profit of £6491. In addition, there was paid out of revenue £614 in reduction of capital account, £300 in extra wages, £600 for the reconstruction of the retort-house gable, and £428 on a crane. The principal causes of profit are: Saving in coal, £1450; saving in carbonizing wages (stoking machinery, &c.), £1755; saving in gas purification by the improved purifying plant, £775; increased yield of sulphate of ammonia, £1144; saving in manufacture of sulphate of ammonia, £174; and saving in interest on loans, £338—these items making a total of £5636. At this rate, the Gas Engineer (Mr. T. Holgate) says, the whole capital expenditure on the sulphate of ammonia plant, after paying interest on it, will be recouped in two years from the time of its being put in operation.

New Joint-Stock Companies.—The English Incandescent Gas Share Company, Limited, has been registered with a capital of £500,000, in £1 shares, to enter into several agreements expressed to be made by the Company with (1) E. Hayes and E. Littlejohn, (2) W. J. Moeller and E. Littlejohn, and (3) F. C. Stoop and Co., and to acquire shares in the capital of the Incandescent Gas-Light Company, Limited, and to carry on business as manufacturers of, and dealers in, incandescent lights, and other apparatus for increasing the illuminating power of gas, spirits, oil, and other light and heat producing agents; as suppliers of light, heat, electric current, or other motive power; electricians, &c. The Val d'Aosta Electric Power Company, Limited, with a capital of £80,000, in £10 shares, is to acquire, take up, and hold concessions for, the utilization of water, &c., in any part of the world, and to carry on the business of an electric light and power company.

The Bolton Corporation Electric Lighting Scheme.—The Bolton Corporation having made an application to the Local Government Board for sanction to borrow a further sum of £17,300 for electric lighting extension, Mr. W. J. G. Clerk, M.Inst.C.E., one of their Inspectors, attended at the Town Hall last Wednesday, for the purpose of holding an inquiry. It was explained that the Corporation originally applied for permission to borrow £40,000, but only obtained £22,700; the Local Government Board reserving their consideration as to the balance until some future date. This was in 1893; and the installation was completed last October. Since then the undertaking had been successful; and as there were numerous applications for the new light, the Town Council had come to the conclusion that the time had arrived for the completion of the original scheme. Alderman Miles, the Chairman of the Gas and Electric Lighting Committee, in answer to the Inspector, expressed the opinion that the new undertaking would eventually pay—perhaps in two, or at any rate in three years. There was no opposition to the proposal.

Saltley (Birmingham) Gas-Works Hospital Fund.—The annual meeting of the contributors to this fund was held last Friday week, under the presidency of the Engineer of the works (Mr. Henry Hack). The report and accounts for the year ending April last showed that the subscriptions amounted to £100 9s. 1d., which, with the balance brought forward and interest, made £121 9s., out of which the Committee expended during the year on behalf of the contributors to the fund £42 9s. 1d. for dispensary and hospital tickets and £4 7s. in gratuities—leaving a balance of £74 12s. 11d. Of this £50 4s. 6d. was voted to the Saturday Hospital Fund, and the balance retained as a reserve. In commenting upon the accounts, the Chairman alluded to the chief items, and directed attention to the reduced balance available for a contribution to the general fund. He said that, as the contribution per member per week was the same as when the works fund was started, and the issue of tickets to the contributors was somewhat less than the previous year, the reduction could only be due to the fewer men now required by reason of the introduction and extension of labour-saving appliances at the works. He added, however, that the contribution proposed for this year was still a handsome one, and a striking contrast with the small yearly donations prevailing prior to the commencement of the weekly payment system; the amount averaging but £7 1s. 4d. in the first period, and £54 8s. 10d. since.

New Water Schemes in East and Mid Derbyshire.—Dr. Barwise, the Medical Officer to the Derbyshire County Council, has projected an extensive scheme for the supply of water to such towns as Belper, Heanor, Ilkeston, Codnor, Codnor Park, Ripley, Heage, South Wingfield, Alfreton, Smalley, &c., comprising a population of about 60,000. In September last, he drew attention to a valuable source of water flowing into the River Derwent, between Whatstandwell and Cromford, known as the Meerbrook Sough. Four analyses of the water have been made, which agree as to its great purity and excellence for dietetic purposes. The Corporations of Ilkeston and Heanor and the Heanor United District Council have the matter under their serious consideration, and have obtained an independent analysis from Dr. E. Frankland, who states that the organic ammonia, and the oxygen absorbed are much lower than even the remarkably low figures of the Derby town supply. The quantity of water coming down this new source is stated to be 150 gallons per second, or nearly 18 million gallons per day. Dr. Barwise says there is no doubt it would be too expensive for one authority to undertake a water scheme of the magnitude he suggests. In his opinion, the best way of utilizing the supply would be for Belper, Ilkeston, and Heanor to unite for a common main as far as Ambergate. The Ilkeston and Heanor main then turning east, supplying branches to Heage and South Wingfield, and, if ever required, to Alfreton and Ripley. Codnor Park and Codnor could then be supplied; and the mains taken through Heanor to Ilkeston—Heanor in turn supplying Smalley. Since the publication of the sketch of Dr. Barwise's scheme, it has been reported that the Belper District Council have consulted Mr. Hodson, of Loughborough, with respect to procuring an additional supply of water; so that it would seem this authority, at all events, will not entertain the proposals of Dr. Barwise. A report from Mr. Hodson, dealing with several alternative schemes, has been submitted to the Council. The one most favoured suggests the obtaining of a supply within the town, so as to avoid heavy compensation. Mr. Hodson recommends that trial bore-holes be made on the property of Messrs. Strutt. To this the Chairman of the Council (Mr. Herbert Strutt, J.P.) has given consent, and has further promised to undertake the expense of boring.

Colchester Corporation New Water-Works.—The Colchester Town Council last Wednesday agreed to recommendations of the Water Committee that application should be made to the Local Government Board for sanction to a loan of £6250, needed for completing the new water-works, and that outlay for works to the extent of £670 should be defrayed out of revenue.

The Surrey County Council and the London Water Question.—Reference has been already made in our columns to the agreement which has been entered into between the London and Surrey County Councils with regard to the transfer to the latter body of a portion of the Metropolitan Water Supply when this shall have been acquired by the former. Under this agreement, the London County Council undertake, in the event of the Transfer Bills passing, to hand over to the Surrey County Council, if they so require it, all the powers to supply and take water within their jurisdiction that are now exercised by the Lambeth and the Southwark and Vauxhall Water Companies. The price to be paid is to be settled by agreement, or, this failing, by arbitration. The agreement is to remain exercisable by the Surrey County Council within a certain period "after the expiration of two years after the price to be paid by the London County Council for the Companies' undertakings shall have been fixed."

Southwark and Vauxhall Water Company.—The Directors of this Company, in their report for the half year ended March 31 last, refer to the opposition they are offering to the eight Bills for the transfer of the several Metropolitan Water Companies which have been introduced into Parliament by the London County Council. The London Valuation Bill, and other measures prejudicial to the interests of the Company, have been so far successfully opposed. The Directors point out that the extraordinary frost of the past winter seriously affected the Company's works and plant, and necessitated enormous expenditure. The outlay for this purpose cannot be computed at less than £20,000, the payment on account of which reduces the amount available for dividend to £24,103, out of which they recommend a half-year's dividend at the rate of 5 per cent. per annum on the preference stock and 4 per cent. per annum on ordinary stock and "D" shares.

Belgrano (Buenos Ayres) Gas Company, Limited.—The report of the Directors of this Company for the past year states that the improvement in consumption amounted to 15 per cent. The ordinary expenditure was exceptionally heavy, consequent upon the relaying of some of the more important mains. The outlay on capital account amounted to £9321. After the payment of debenture interest and writing down the liquid assets to their sterling value on Dec. 31, the net revenue of the year amounted to £5507; and deducting from this the debit balance of £906 for 1893, there remains £4600. Of this, the Directors propose to transfer £1000 to the reserve account, bringing this up to £3000; to write off £500 from the parliamentary and other charges; and to recommend the payment of a dividend of 1 per cent., tax free—leaving £1000 to be carried forward. The report came before the shareholders at their ordinary general meeting last Tuesday, and was adopted.

Reductions in Price.—The price of gas at Newmarket will be reduced, on the 6th prox. to 3s. 10d. per 1000 cubic feet. In making this announcement, the Directors of the Company state that they are prepared to supply gas on the prepayment system—laying the gas free to any cottage within 60 feet of the mains, fitting it up with two lights and a small boiling-stove, and supplying 18 cubic feet of gas for a penny. The Gas Committee of the Darwen Town Council have recommended a reduction in the price of gas by 3d. per 1000 cubic feet, to date from the 1st prox. The price will then be 3s. 3d. instead of 3s. 6d. At the June meeting of the Burnley Town Council, Alderman Collinge, the Chairman of the Gas Committee, explained that the price of gas had been reduced as follows: To consumers within the borough, from 3s. to 2s. 9d. per 1000 cubic feet, and to those outside, from 3s. 10d. to 3s. 3d. He added that, notwithstanding the reduction in price, they would still have a profit balance of £8000 at the end of the year; and he did not know of any borough where they were paying off the sinking fund as fast as was the case with them in Burnley. At the end of the present financial year, his Committee hoped to be in a position to make another reduction of 3d. per 1000 cubic feet.

The Proposed Water Trust for West Kent.—At the last meeting of the Bromley Rural District Council, the Solicitors (Messrs. May, Sykes, and Co.) presented a report on the position of the Council in regard to the Water Bills of the London County Council. They stated that negotiations had been opened with the London County Council for the transfer of the Kent Water-Works to the Kent County Council on behalf of the Urban and Rural District Councils, who are now being supplied with water by the Company; and that these negotiations were likely to result in a formal agreement. They pointed out that the Chairman of the Parliamentary Committee on the above-named Bills had stated that it was their intention to proceed on the assumption that, in the opinion of Parliament, it is desirable to establish a single public representative Water Authority for the Metropolis. It therefore appeared that the suggestion of Sir John Lubbock, to which reference has been already made in the JOURNAL, had not been adopted. If, however, the Committee came to the conclusion that the London County Council should be the Water Authority, there was no alternative left to the outside bodies but to be the Water Authorities for their respective districts. If Parliament had not expressed so strong a conviction that the people should have the control of the water supply throughout the country, Sir John Lubbock's ideas might perhaps have been carried into effect; but so far as the Kent undertaking was concerned, the financial position and the prospects of the Company were such that, if the Kent Authorities succeeded in purchasing the Company's works, they would be the possessors of a property of a highly remunerative character. The Clerk to the Council (Mr. R. Gordon Mullen), who has been in attendance at the House of Commons during the inquiry, said he thought they would have very little difficulty in arranging the heads of an agreement with the London County Council as to the terms of purchase; but there was a little trouble as to the severance of the sources of supply and works of distribution. He was bound to say the Council seemed desirous of meeting them in an amicable and satisfactory way.

The National Meter Company, Limited, have appointed Messrs. Henry Greene and Sons sole consignees of the new prepayment meter made by the Company; and the meter will henceforth be sold under the trade mark of "Stiddgreen."

Gas-Works Extensions at Darlington.—The Darlington Corporation have determined, on the advice of the Gas Committee, to purchase a piece of land, measuring nearly 4 acres, from the Darlington Forge Company, for £2500. This land will give sufficient space for a new gasholder which the Committee contemplate erecting, as well as for future extensions. The price is considered reasonable; and it includes property producing £50 per annum.

Gas-Works Extensions at Ilkeston.—On Friday last, Mr. T. Codrington, M.Inst.C.E., held an inquiry at Ilkeston as to an application received from the Ilkeston Corporation for leave to borrow £4000 for gas-works purposes. The proceedings were purely formal. The Committee were represented by Mr. Alderman Richards, the Chairman, Mr. Bloor, the Vice-Chairman, Messrs. Archer and Truman, and the Town Clerk, who opened the proceedings. The Engineer (Mr. F. C. Humphrys) detailed the scheme, which includes £2600 for increased storage, £500 for buildings, £200 for enrichment plant, and the balance for mains to supply various new streets and districts in the borough. After the inquiry, the Inspector visited the district and works, and promised to report in due course.

Exhibitions of Gas Appliances.—Last Tuesday, an exhibition of gas appliances was opened in the West-end Hall, Rothesay, by Messrs. R. and A. Main, of Glasgow and London. The representative of the firm (Mr. J. A. Maclay) inaugurated the exhibition with a few appropriate remarks on the advantages to be derived from the use of gas as a cooking agent; and these were followed by practical demonstrations by Miss M. M'Naughton. The exhibition remained open till Friday, with cookery lectures daily, and was well attended. The Corporation Gas Engineer (Mr. J. Ballantyne) was present at the opening. On Wednesday and Thursday, an exhibition of gas appliances was held at Carnforth, in connection with the local Gas Company. The attendance was good; and lectures by Miss Holroyd proved very attractive.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1253.)

Issue.	Share	When ex-Dividend.	Dividend or Int. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	21¼ - 22½	..	4 13 4
100,000	10	,,	7½	Do. 7 p. c.	10	14½—15½	..	4 16 9
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
200,000	5	10 May	6½	Bombay, Limited	5	6¾—7¼	..	4 9 8
40,000	5	,,	6½	Do. New	4	4¾—5¼	..	4 19 2
380,000	Stck.	28 Feb.	11½	Brentford Consolidated	100	245—250	..	4 12 0
180,000	,,	,,	8½	Do. New	100	195—200	..	4 5 0
220,000	Stck.	14 Mar.	11	Brighton & Hove Original	100	220—225	..	4 17 9
888,500	Stck.	28 Feb.	5	Bristol	100	120—123	..	4 1 4
320,000	20	28 Mar.	11½	British	20	52—53	..	4 4 10
50,000	10	14 Mar.	11½	Bromley, Ordinary 10 p. c.	10	22—23	..	5 0 0
51,510	10	,,	8½	Do. 7 p. c.	10	17—18	..	4 14 5
328,750	10	14 Nov.	4†	Buenos Ayres (New) Limited	10	7½—8	..	5 0 0
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100—103	..	5 16 7
150,000	20	28 Feb.	8½	Cagliari, Limited	20	26½—27½	..	6 0 0
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	290—295	..	4 11 6
165,000	,,	,,	10½	Do. New do.	100	214—219	..	4 15 10
160,762	,,	13 Dec.	4½	Do. 4½ p. c. Deb. do.	100	138—143	..	3 2 11
800,000	Stck.	13 Dec.	13	Continental Union, Limited.	100	252—257	..	5 1 2
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	205—210	..	4 15 3
535,000	Stck.	28 Feb.	5½	Crystal Palace Ord. 5 p. c. Stk	100	122—127	+2	4 2 8
486,090	10	31 Jan.	11	European, Limited	10	24—25	..	4 8 0
354,060	10	,,	11	Do. Partly pa d	7½	17—18	..	4 11 9
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	274—279	+1	4 6 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105—110	..	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	277—282	..	3 10 10
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	197—202	..	3 14 3
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	188—193	..	3 12 6
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	277—282	+2	3 10 10
476,000	,,	,,	6	Do. K, 6 p. c. Prf..	100	165—170	+2	3 10 7
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	129—132	..	3 0 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	140—145	..	3 2 1
908,000	,,	,,	6	Do. 6 p. c. do.	100	188—192	..	3 2 6
3,800,000	Stck.	10 May	12	Imperial Continental	100	245—250	−2	4 16 0
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd.	5	5¾—6¼	..	4 16 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	100	110—112	..	4 9 3
541,920	20	14 Nov.	5	Monte Video, Limited	20	15½—16½	..	6 1 2
150,000	5	24 May	8	Oriental, Limited	5	7—7⅞	..	5 6 8
60,000	5	28 Mar.	7	Ottoman, Limited	5	4⅜—5⅛	..	6 13 4
166,870	10	14 Feb.	2	Para, Limited	10	1⅞—2⅛	..	8 0 0
420,000	100	2 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	102—106	..	5 13 2
500,000	100	4 June	6	2nd Do.	100	100-105*	+1	5 14 3
150,000	10	26 Apl.	7	San Paulo, Limited	10	8½—9½	..	7 7 4
500,000	Stck.	14 Feb.	15½	South Metropolitan, A Stock	100	350—360	..	4 6 1
1,350,000	,,	,,	12	Do. B do.	100	295—300	..	4 0 0
290,000	,,	,,	13	Do. C do.	100	307—312	..	4 3 4
775,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	100	168—173	..	2 17 10
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	230—235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	28 Dec.	10⅝	Chelsea, Ordinary	100	280—285	+3	3 11 0
1,719,514	Stck.	10 Apl.	8	East London, Ordinary	100	219—224	+2	3 11 5
654,740	,,	28 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	151—156	..	2 17 8
700,000	50	13 Dec.	7†	Grand Junction	50	107—110	−½	3 3 7
708,000	Stck.	14 Feb.	12	Kent	100	304—309	..	3 17 8
1,043,800	100	28 Dec.	7½†	Lambeth, 10 p. c. max.	100	233—238	..	3 3 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
330,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	136—140	..	2 17 2
500,000	100	14 Feb.	12½	New River, New Shares	100	350—360	..	3 10 9
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk.	100	140—143	..	2 15 11
902,300	Stck.	13 Dec.	4†	S'thwk & V'xhall, 10 p.c. max.	100	140—145	−2	2 15 2
126,500	100	,,	4†	Do. D 7½ p.c. do.	100	138—143	..	2 15 11
1,155,066	Stck.	13 Dec.	10	West Middlesex	100	271—276	+1	3 12 6

*Ex div.

† Next dividend will be at this rate.

Tuam Gas Supply.—We learn that Mr. T. M. Walsh, who was Manager of the Kilrush Gas-Works, has been giving his attention to the improvement of those at Tuam, with the result that he has converted the concern into a profitable one, though it was in a very low condition when he took it in hand. All the houses of business, as well as the railway station, are lighted with gas; and the proprietors of a local paper have ordered a supply for their gas-engines.

Liverpool Corporation Employees and the Late Frost.—The Water Committee of the Liverpool Corporation are proposing to recognize the extra services rendered by their staff during the frost of last winter by distributing among the deserving members sums ranging from £1 to £10. The City Council have agreed to a recommendation that, for this purpose, a sum of £250 be placed at the disposal of the Chairman and Deputy-Chairman of the Committee and their Engineer (Mr. Joseph Parry).

Water-Works Extension at Bolton.—The Bolton Corporation have applied to the Local Government Board for sanction to borrow a further sum of £11,000 for water-works purposes. Last year they obtained a Provisional Order to borrow, with the sanction of the Local Government Board, £100,000 for an extension of their water-works. Under this power, they have already spent £24,613, and now need an additional sum of £11,000 to acquire two estates, containing 943 acres, which adjoin their watershed at Entwistle. This purchase is considered necessary in order to give the Corporation the power, as owners, of preventing the pollution which now goes on from the drainage of manure into the stream from various farms in the vicinity. Altogether, a sum of £65,000 is required for the purchase of land, and the £11,000 is the first portion of the amount.

Oldham Electric Lighting Undertaking.—The Electric Lighting Committee of the Oldham Town Council have favourably entertained a suggestion made by Professor Kennedy, that application should be made to the Local Government Board for power to borrow £15,000 for extending the electric lighting system. The annual accounts show that the total amount spent on capital account at March 25 last was £25,350. The gross revenue for the year was £1915; and the expenditure, £1271—the balance carried forward to the net revenue account being £644. The amount of interest on loans is £643, and the instalment to sinking fund, £153; so that the deficiency on the year's working is £152. The number of meters fixed at March 25 was 62; and the lights supplied were equal to 6940 of 8-candle power.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

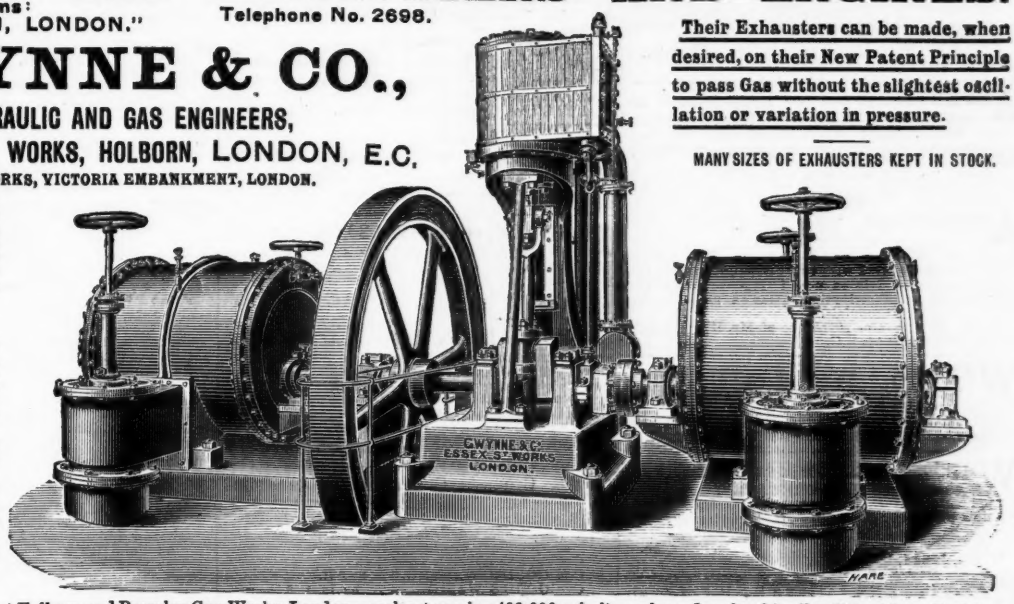
GWYNNE & CO.,
HYDRAULIC AND GAS ENGINEERS,
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director,
Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.

Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.
**See Advertisement p. 1280 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality.
Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address "PORTER LINCOLN."

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office MIDDLESBROUGH. Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

AMMONIA SATURATORS.

WALTER THOMASON and SONS,
Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel.
Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.
J. HARDMAN, Manufacturing Chemist.
Milton, Staffs.

ADVERTISER desires Engagement as ASSISTANT to Engineer or Manager of Gas or Water Works. Eight years' experience. Drawing, Quantities, and Specifications, in addition to ordinary routine.
Address No. 2534, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER, with 25 Years' Ex- perience as Working Manager and Foreman, desires a Situation as WORKING FOREMAN. Practically acquainted with every detail of work in the Construction and Maintenance of Gas-Works, and the Manufacture and Distribution of Gas on modern principles. Good Testimonials.
Please address No. 2539, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady and experienced person as GAS-FITTER, MAIN and SERVICE LAYER, and able to repair Meters.
Apply, stating Age and Experience, to W. H. NUTTER, Manager, Gas-Works, ST. ANNE'S-ON-THE-SEA.

WANTED, by the Corporation of Wigan, a practical SULPHATE MAKER.
Applications, in writing only, with References (Testimonials will not be considered), to be addressed to
JOS. TIMMINS,
Engineer, &c.
Wigan, June 1, 1895.

GAS-FITTERS, having a Basket of small Tools, can have PERMANENT EMPLOYMENT in fitting up Tenements with Barrel on the Penny-in-the-Slot System.
Apply, by letter only, with Copies of References to HENRY GREENE & SONS, 34, Greyhound Road, HAMMERSMITH, W.

TO GAS-FITTERS.

WANTED, a Young Man, competent for Compo. or Iron, Indoor Fittings, with experience in Shop Work. With good character. Constant employ will be given.
Address No. 2538, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Foreman, for a Gas-Works using 120 Tons of COAL per day in Winter. Must understand Regenerative Furnaces; and a preference will be given to one acquainted with Stoking Machinery.
Apply, by letter, stating Wages required, &c., to No. 2537, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Sheffield United Gas- light Company, an efficient ACCOUNTANT to fill the post of Chief Accountant. Must have a thorough knowledge of Bookkeeping by double entry.
Applications, by letter (endorsed "Accountant"), stating Age, Salary required, and previous Engagements, to be made to the General Manager, Mr. Hanbury Thomas, not later than Saturday, June 15.
Commercial Street, Sheffield,
May 24, 1895.

TO CHEMISTS.

THE Directors of the Sheffield United Gaslight Company require a CHEMIST. One who has a knowledge of Gas-Works preferred. He will be required to make Analyses of Gas, Residuals, and various Products therefrom, and of all Materials used in the Manufacture of Gas, or in connection therewith. The whole of his time must be devoted to the service of the Company.
Applications, marked "Chemist," stating Qualifications, Age, Salary required, previous Engagements, &c., to be sent in not later than June 15, addressed to the undersigned.
Testimonials not to be sent till asked for.
HANBURY THOMAS,
General Manager.
Gas Company's Offices,
Commercial Street, Sheffield,
May 30, 1895.

BACK-PRESSURE IN PURIFIERS.

THE Valve invented by Mr. Cripps for Bye-Passing any Layer of Purifying Material (referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

In Paper Covers, Post Free 2s.

STEPHEN CARPENTER, of the Bow Common Gas-Works, on the Purification of Coal Gas by Lime, Oxide of Iron, and Atmospheric Air, and the Method of Working Purifiers so that the Lime may be used a second time, with a description of Carpenter's short Method of working off the Sulphur Test and Table for calculating Results.
S. & H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

SLAITHWAITE GAS COMPANY, NEAR HUDDERSFIELD.

WANTED, a steady Young Man as METER INSPECTOR and FITTER. Must be able to repair and test Meters.
Apply, stating Age, Wages, &c., not later than Monday, June 17, to
JNO. FURNISS,
Secretary and Manager.

GAS TAR Wanted.
TAR DISTILLERY "PERSEVERANTIA," LIMITED, Harlingen, HOLLAND.

GAS 5-feet Testing Holder Wanted.
Second Hand; complete. State Price.
Address the NATIONAL METER COMPANY, LIMITED, Aquinas Street, STAMFORD STREET, S.E.

SCRUBBER.

WANTED, a second-hand Scrubber, about 7 feet diameter by 45 feet high.
Address No. 2532, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, cheap—One 20,000 cub. feet per hour Beale's EXHAUSTER, with two 8-inch Disc Valves. Also one to pass 5000 Cubic Feet per hour. Both in perfect condition.
Apply to SAMUEL WHILE, 60, Queen Victoria Street, LONDON, E.C.

FOR SALE—A Station Gas-Meter (nearly new) of 7000 Cubic Feet per hour capacity, by J. & J. Braddock. It has only been in use about eighteen months. Also a STATION METER of 10,000 Cubic Feet per hour capacity, by W. Parkinson and Co., London, both in first-class condition.
Can be seen at any time on application, by letter, to No. 2531, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Croydon Commercial Gas Com- pany have the under-mentioned PLANT FOR SALE, namely—
Various FITTINGS, including Mouthpieces, &c., of Nine Single Settings of Retorts.
One BATTERY CONDENSER.
One GOOD'S WASHER, 6 ft. by 9 ft.
One GOOD'S WASHER, 8 ft. by 13 ft. 6 in. with 12-inch Connections and Valves.
Three 12 feet Square PURIFIERS, with 12-inch Valves and Connections, Lifting Apparatus, &c.
One EXHAUSTER and ENGINE, with Fittings and Connections complete.
Two SINGLE-LIFT HOLDERS, 80 feet and 60 feet diameter respectively.
One 10,000 feet per hour STATION METER.
The above Apparatus is in good condition, and is being disposed of as the Carshalton Works have been thrown out of use.
The LAND and BUILDINGS are also FOR SALE.
Further Particulars may be obtained on application to Mr. J. W. HELPS, Gas-Works, CROYDON.

WARE GASLIGHT AND COAL AND COKE COMPANY, LIMITED.

COAL SUPPLY.

THE Directors of the above Company invite TENDERS for the supply of from 900 to 1200 Tons of EAST PONTOP, NEW PELTON, or PELAW MAIN GAS COALS, to be considered at their Meeting to be held on Tuesday, the 18th day of June inst.
Full Particulars may be obtained on application to me the undersigned at my Office.
Dated this 4th day of June, 1895.
GEO. H. GISBY,
Secretary to the Company.
Baldock Street, Ware.

NEW MILLS URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL, ETC.

THE New Mills Urban District Council invite TENDERS for the supply of best GAS COAL and CANNEL for the Year ending June 30, 1896.
Estimated quantity 1000 Tons (more or less) of Coal, and 300 Tons (more or less) of best Cannel, to be delivered in such quantities as may be required from time to time at the L. & N.W. or Midland Railway Stations, New Mills.
Form of Tender and full Particulars may be had on application to Mr. E. Jones, the Gas Manager.
Tenders, with Analysis and full Particulars of the Coal and Cannel offered, to be sent in to the undersigned, not later than June 17, 1895, and to be endorsed "Tender for Gas Coal and Cannel."
TENDERS are also invited for the purchase of the surplus TAR and LIQUOR for One Year ending June 30, 1896. Coal carbonized, 1300 Tons.
The Council do not bind themselves to accept any tender.
JOSEPH POLLITT,
Clerk.
Town Hall, New Mills,
May 29, 1895.

TENDERS FOR COAL.

THE Directors of the Adlington Gas Company, Limited, are prepared to receive TENDERS for the supply of about 900 Tons of best screened GAS COAL, 60 Tons of CANNEL, and 100 Tons of SLACK, to be delivered (free) at Adlington or White Bear Stations, in such quantities as required during the Twelve Months ending Aug. 31, 1896.
Tenders to be sent in to the Chairman of the Company not later than June 25, 1895, endorsed "Tender for Coal."
WALTER ALKER,
Secretary.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Adlington Gas Company, Limited, are prepared to receive TENDERS for TAR and AMMONIACAL LIQUOR produced at their Works from Sept. 1, 1895, to Aug. 31, 1896.
Quantity of Coal Carbonized, about 950 Tons.
Tenders to be sent in to the Chairman of the Company not later than June 25, 1895, endorsed "Tender for Tar."
WALTER ALKER,
Secretary.

CITY OF CARLISLE.

TAR CONTRACT.

THE Carlisle Gas Committee are pre- pared to receive TENDERS for the surplus TAR to be produced at their Works, for a period of One or more Years from the 30th of June next.
Any further Particulars required can be obtained upon application to the Engineer, to whom sealed tenders, endorsed "Tender for Tar," must be delivered on or before July 1, 1895.
The Committee do not bind themselves to accept the lowest or any tender.
C. B. NEWTON,
Engineer.
Gas-Works, Carlisle,
June 7, 1895.

TENDERS FOR GAS COAL.

THE Directors of the Chelmsford Gas- light and Coke Company invite TENDERS for the supply of about 3500 Tons of GAS COAL for delivery over the Year ending July 31, 1896.
Sealed tenders, endorsed "Tender for Coal," must be delivered at the Office of the Company not later than the 25th of June next.
The Directors reserve to themselves the right to decline the lowest or any tender.
Further Particulars and Forms of Tender to be obtained of the undersigned on application.
By order,
E. G. SMITHARD,
Engineer.
Gas-Works, Chelmsford,
June 8, 1895.

NEWARK GAS COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Newark Gas Com- pany are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, free on Rail, G.N.R. or M.R., in Purchaser's Tanks, for One Year from the 1st day of July, 1895.
Terms: Cash monthly.
Further Particulars can be obtained on application to the undersigned, to whom sealed tenders are to be sent on or before the 18th inst., marked on the outside "Tender for Tar."
The Directors do not bind themselves to accept the highest or any tender.
By order,
F. B. FOOTTIT,
Secretary.
Newark, June 6, 1895.

NEWARK GAS COMPANY.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR produced at their Works for One Year, from the 1st day of July, 1895, at per degree Twaddel (Temperature 60° Fahr.). The Liquor to be not less than 5° in strength.
Terms: Cash monthly.
Further Particulars can be had on application to the undersigned, to whom sealed tenders, marked on the outside "Tender for Liquor," are to be sent in on or before the 18th inst.
The highest tender will not be necessarily accepted.
By order,
F. B. FOOTTIT,
Secretary.
Newark, June 6, 1895.

FERNDALE GASLIGHT AND COKE AND WATER-WORKS COMPANY, LIMITED.

TO GASHOLDER MAKERS.

THE Directors of the above Company are prepared to receive TENDERS for the CAST and WROUGHT IRON WORK and STEEL required in the construction and erection of a GASHOLDER TANK, 62 feet in diameter and 18 ft. 3 in. deep, a SINGLE-LIFT GASHOLDER, with Guide-Framing, Inlet and Outlet Pipes, and Sundry RETORT-BENCH MOUNTINGS.
The Drawings and Specification may be seen at the Offices of Messrs. Thomas Newbigging and Son, Civil Engineers, 5, Norfolk Street, Manchester.
Quantities and Forms of Tender may be obtained from the Engineers on deposit of Two Guineas, which will be returned on receipt of a *bond-fide* tender.
Tenders, endorsed "Gasholder, &c., Contract No. 3," to be sent so as to reach me not later than Thursday, the 4th day of July, 1895.
The Directors do not bind themselves to accept the lowest or any tender.
JOSEPH SPRAGUE,
Secretary.
Pontypridd, June 7, 1895.

GAS COAL.

THE Middlesbrough Corporation Gas Committee invite TENDERS for the supply of 40,000 Tons of GAS COAL required during the ensuing Twelve Months. Delivery may be by Rail at the Gas-Works or by Ship at the Corporation Wharf, Middlesbrough.

Schedules may be had on application to Mr. David Terrace, Gas Manager, Middlesbrough.

Sealed tenders, endorsed "Gas Coal," are to be delivered at the Office of the Town Clerk of Middlesbrough on the 20th of June.

WORTHING GAS COMPANY.

CAST-IRON MAINS.

TENDERS are invited for 1700 Yards of 5-inch common SOCKET PIPES, in 9-feet lengths, and coated.

Tenders at per ton, delivered at Worthing Railway Station, to be sent to the undersigned, on or before the 19th inst.

W. A. WALKER,
Manager.

Offices and Works:
Park Road, Worthing.

SURPLUS TAR.

THE Gas Committee of the Corporation of Coventry are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, Coventry, for One Year from July 1 next.

Make about 2000 Tons per annum.

Tenders, stating price per ton delivered into Boat, to be addressed to the Manager on June 17, and marked "Tender for Tar."

The Committee do not bind themselves to accept the highest or any tender.

GEO. WINSTANLEY, Assoc.M.Inst.C.E.,
Manager.

Gas-Works, Coventry,
June 7, 1895.

TENDERS FOR GAS COAL.

THE Directors of the Victoria New- market Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the supply of 4500 Tons of best screened GAS COAL during the ensuing Twelve Months ending June 30, 1896.

Tenders, stating price per ton delivered free at Newmarket Station as required, to be sent, on or before the 22nd inst., to the undersigned, from whom any further Particulars may be obtained.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket,
June 5, 1895.

MORECAMBE GAS AND LIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 3000 Tons per Annum of screened GAS COAL, to be delivered on the Gas-Works Siding, Midland Railway, Morecambe, in such quantities as may be required, during a period of One, Two, or Three Years.

Tenders, specifying the description of Coal, the name of the Pit at which it is raised, and the Terms for net monthly payments, are to be sent in on or before Saturday, the 22nd of June, 1895, endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender.

WILLIAM DUFF,
Secretary and Manager.

Market Street, Morecambe,
June 1, 1895.

TIPTON GAS-WORKS.

COAL CONTRACTS.

THE Gas Committee of the Tipton Urban District Council are prepared to receive TENDERS for the supply of GAS COAL for a period of One, Two, or Three Years, from the 1st of July next; to be delivered, carriage free, to the Gas-Works Siding (L. & N.W. Railway).

Specification and Form of Tender may be obtained at the Gas-Works, on application to Mr. Vincent Hughes, the Engineer and Manager.

Sealed and endorsed tenders to be sent to me the undersigned not later than Ten a.m., on Saturday, the 22nd inst.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
GEO. M. WARING,
Clerk to the Council.

Public Offices, Tipton,
June 4, 1895.

COMMERCIAL GAS COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of 190,000 Tons of clean, dry, unscreened, fresh-wrought GAS COALS, delivered f.o.b. to the Company's Steamers at any suitable Port, during the Year ending the 31st of July, 1896.

The deliveries to be in equal monthly quantities throughout the Year.

Payment in cash monthly.

Parties desiring to tender for more than One Year must state separately the price and quantity offered for each Year.

Particulars and Forms of Contract may be obtained from the Engineer, Mr. H. E. Jones.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, sealed and endorsed "Tender for Coals," to be addressed to the Chairman of the Coal Committee, and delivered at the Company's Offices not later than Twelve o'clock on the 19th of June, 1895.

Commercial Gas-Works, Stepney, E.,
May 30, 1895.

HORLEY DISTRICT GAS COMPANY, LIMITED.

THE Directors invite Tenders for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Works during the Year ending June 30, 1896.

By order,
RICHARD SANDELL,
Secretary.

3, Jeffreys Square, London, E.C.,
June 10, 1895.

GLASGOW CORPORATION GAS.

TENDERS FOR METERS.

THE Corporation of Glasgow invite TENDERS for the supply of such METERS (Dry and Wet) as they may require for Twelve Months from this date.

Forms of Tender may be had on application to the Manager, at the Gas Office, 45, John Street, Glasgow; and sealed offers, marked "Tender for Meters," to be addressed to, and lodged with, the Subscriber on or before Tuesday, the 18th current.

The Corporation do not bind themselves to accept the lowest or any offer.

J. D. MARWICK,
Town Clerk.

City Chambers, Glasgow,
June 3, 1895.

SCARBOROUGH GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Scarborough Gas Company invite TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR to be produced at their Works for One or more Years from the 1st day of July next.

Tenders for Liquor may be submitted either at a fixed price per ton or on a sliding scale, regulated by the price of Sulphate. Preference will, however, be given to the latter.

Further Particulars may be obtained on application to the undersigned, to whom sealed tenders (duly endorsed) must be delivered not later than Noon, on Saturday, the 15th day of June next.

The Directors do not bind themselves to accept the highest or any tender.

By order of the Board,
(Signed) J. HOLLIDAY,
Engineer and Secretary.

Gas Offices: 32, Westborough,
Scarborough, May 17, 1895.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas- light Company invite TENDERS for the supply of about 12,800 Tons of Screened GAS COALS, and about 700 Tons of good English CANNEL, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during One, Two, or Three Years, commencing July 1, 1895.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any tender.

Tenders must be made on Forms (containing further particulars) which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned, on or before the 22nd day of June, 1895.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
May 20, 1895.

BOROUGH OF BURTON-UPON-TRENT.

TAR.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS for the purchase of the surplus TAR to be produced at their Works during Twelve Months from the end of July next.

Probable quantity of Coal carbonized during the Twelve Months, 25,000 Tons.

The Tar will be delivered free into Contractor's Tank-Trucks, on the Gas-Works Railway Siding.

Payments: Net cash Monthly.

Tenders, sealed, and endorsed "Tender for Tar," are to be delivered to me, at or before Ten a.m., on Friday, the 28th of June inst.

The highest or any tender will not necessarily be accepted.

F. L. RAMSDEN,
Manager and Engineer.

Gas and Electric Light Works,
Burton-upon-Trent, June 8, 1895.

HAYWARDS HEATH GAS COMPANY, LIMITED.

GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 1500 Tons of GAS COAL, to be delivered in such quantities and at such periods as may be ordered, until the 30th of June, 1896.

The Coal required is to be unscreened, and to be delivered, in Trucks, free at the Haywards Heath Railway Station, L.B. & S.C. Railway, either from the South Yorkshire or Durham Coal-Fields.

Payments: Net Cash monthly.

Tenders are to state the name of the Pits from which the above description of Coal will be supplied; the same to be fresh wrought, and free from Slate, and to the entire satisfaction of the Company's Manager.

The Board have no special Form of Tender, and do not bind themselves to accept the lowest or any tender.

Tenders are to be received by me on or before the 20th day of June next, and endorsed "Tender for Gas Coal."

(Signed) ARTHUR H. CESAR,
Secretary.

85, Gresham Street,
London, E.C.

DUKINFIELD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas Committee of the above Council invite TENDERS for the TAR produced at the Works for the Year commencing the 1st of July next.

The quantity made is about 400 Tons, and will be delivered free into Boats on the Canal, or in Barrels at the Works.

Tenders, endorsed "Tar," to be here by Saturday, the 22nd inst.

HARRISON VEEVERS, C.E.,
Engineer and Secretary.

King Street, Dukinfield,
June 6, 1895.

THE BRISTOL GAS COMPANY.

TENDERS FOR GAS COAL AND CANNEL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of their requirements (say, 160,000 Tons) of GAS COALS during the period commencing the 1st of September next, and ending the 30th of June, 1896.

The Stapleton Road Works are now connected by Sidings with both the Great Western and Midland Systems.

Particulars and Forms of Tender may be obtained on application to the undersigned, to whom also tenders, sealed and endorsed "Tender for Coal," must be delivered not later than Ten a.m., on Wednesday, the 26th day of June next.

JOHN PHILLIPS,
Secretary.

Chief Offices: Canons' Marsh,
Bristol, May 31, 1895.

LONGWOOD GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Year ending June 30, 1896.

Price per ton for Liquor per degree at 5° and 6° Twaddel. The estimated quantity for disposal is about 1000 Tons.

Tenders, sealed and endorsed, to be sent in not later than Tuesday, June 18, 1895, addressed to Edward Armitage, Esq., J.P., Chairman, Longwood Gas Company, Longwood, Huddersfield.

JOHN L. MITTON,
Manager and Secretary.

BOROUGH OF HUDDERSFIELD.

GAS COAL.

THE Gas Committee of the Huddersfield Corporation are prepared to receive TENDERS, from Colliery Proprietors only, for the supply and delivery of about 50,000 Tons of best quality unscreened, fresh wrought GAS COAL.

Form of Tender and full Particulars may be obtained on application to Mr. W. R. Herring, Engineer, Gas-Works, Huddersfield.

Sealed tenders, endorsed "Tender for Coal," to be addressed and sent to him, not later than Tuesday, the 18th of June, 1895.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
F. C. LLOYD,
Town Clerk.

Town Hall, Huddersfield,
May 24, 1895.

SMETHWICK GAS-WORKS.

TENDERS FOR GAS COAL, CANNEL, AND LIME.

THE Gas Committee of the Urban District Council of Smethwick invite TENDERS for the supply of about 17,000 Tons of GAS COAL, and 300 Tons of CANNEL for delivery over the Year ending the 30th of June, 1896.

Forms of Tender may be obtained from the undersigned.

TENDERS are also invited for the supply of about 250 to 300 Tons of PURIFYING LIME during the same period.

Sealed tenders, endorsed "Tender for Gas Coal" or "Lime" (as the case may be), and accompanied, if possible, by an Analysis, to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned on or before June 24, 1895.

By order,
W. J. STURGES,
Secretary.

Public Buildings, Smethwick,
May 31, 1895.

COUNTY BOROUGH OF BURY.

(GAS DEPARTMENT.)

THE Corporation are prepared to receive TENDERS for the supply, for One, Two, or Three Years, of

3000 Tons of CANNEL per annum.		
30,000	,,	GAS COAL ,,
500	,,	BURGY ,,
200	,,	HOUSE COAL ,,

The same to be delivered in such quantities and at such t mes as the Gas Engineer of the Corporation may from time to time order.

Printed Forms of Tender and Conditions of Contract may be obtained on application to Mr. W. H. S. Gendall, Engineer, Gas-Works, Bury.

Tenders, which must be on the printed forms, and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Bury, marked "Tender for Gas Coal," to be delivered not later than the 21st of June, 1895.

Preference will be given to those persons or firms who pay to their workpeople the regular standard rate of wages obtaining at the time in the town or district.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
May 31, 1895.

GAS COAL AND CANNEL.

THE Malvern Urban District Council invite TENDERS for the supply of 2500 Tons of best double screened SILKSTONE GAS COAL and 100 Tons of best CANNEL, to be delivered and stacked at the Gas-Works, Great Malvern, in such quantities as may from time to time be required, before the 30th of November next.

Tenders, endorsed "Tender for Gas Coal," to be sent to me on or before Monday, the 17th inst.

WM LAMBERT,
Clerk to the Council.

Malvern, June 7, 1895.

COLNE URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of GAS COAL for One Year from the 1st day of August next.

Particulars and Form of Tender may be obtained from the undersigned, to whom the tenders must be delivered on or before the 17th day of June.

The Committee do not bind themselves to accept the lowest or any tender.

(Signed) HY. SIMMONDS,
Engineer and Manager.

Gas-Works, Colne,
June 1, 1895.

TENTERDEN GAS COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company invite separate TENDERS for the supply of 600 Tons of best PELAW MAIN GAS COAL, delivered at Headcorn and Appledore Stations, S.E.R.—400 Tons to be delivered in July, August, and September; the remainder, as and when required.

Sealed tenders, endorsed "Coal," to be sent to the Secretary by June 20.

The Directors do not bind themselves to accept the lowest or any tender, or supply forms of tender.

W. T. MERCER,
Secretary.

Tenterden, June 5, 1895.

BOROUGH OF DONCASTER.

TENDERS FOR COALS.

THE Gas Committee of the Borough of Doncaster are prepared to receive TENDERS for the supply of 14,000 Tons of best GAS COAL during a period commencing July, 1895, and terminating June 30, 1896.

Particulars and Tender Forms may be obtained on application to John Athron, Esq., Chairman, or to the undersigned.

Tenders should be sent, under seal, to the Chairman, endorsed "Tender for Coal," not later than Ten a.m., on Wednesday, the 10th of July next.

By order of the Gas Committee, who do not bind themselves to accept the lowest or any tender.

RT. BRIDGE,
Engineer.

Gas-Works, Doncaster,
June 6, 1895.

MILLOM URBAN DISTRICT COUNCIL.

TENDERS are invited for the supply of 1600 Tons of GAS COAL, at such times and in such quantities as the Council may require, during Twelve Months, from the 1st of July next.

The Coal must be of best quality, and as free as possible from Bats, Pyrites, and Dross.

Full Particulars of the Coal and Colliery, and an epitome of the Working Analysis to be given.

The price per ton delivered free at Millom Station, and (where applicable) at the nearest or most available Port to the Colliery or Depôt, to be stated.

Sealed tenders, on Forms (which can be had on application), endorsed "Tender for Coal," to be sent to me not later than the 17th of June.

The Council will not be bound to accept the lowest or any tender.

W. T. LAWRENCE,
Clerk to the Council.

Council Offices, Millom,
June 6, 1895.

BANDON TOWN COMMISSIONERS (CO. CORK).

TENDERS FOR GAS COAL.

TENDERS are invited for the supply of 250 Tons of best double-screened GAS COAL in the first week of August next—viz.,

F.o.b. at Liverpool,
" " Newcastle-on-Tyne;
Or delivered free of all charges—*i.e.*,
At Albert Quay, Cork,
" Courtmacsherry Pier,
" Kilmacsimon Quay,
at per Ton. One of the two latter Ports preferred.

Contractor to state on face of tender the Pit from which he proposes to supply the Coal, produce Bill of Lading and Colliery Certificate previous to commencement of delivery.

Tenders, sealed and endorsed "Tender for Gas Coal," to be sent in to the Bandon Town Commissioners not later than the 20th inst.

The Commissioners do not bind themselves to accept the lowest or any tender.

By order,
JOHN M'DONNELL,
Town Clerk.

Board-Room, Bandon,
June 3, 1895.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS in respect both to the Four-and-a-Half and Three Per Cent. DEBENTURE STOCK WILL BE CLOSED on the 15th of June inst., and re-opened on the 1st day of July, 1895.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, Bishopsgate, E.C.,
June 6, 1895.

THE Directors of the Boughton Blean Gas and Coke Company, Limited, invite TENDERS for the erection of a 21-feet GASHOLDER, 6 ft. by 4 ft. 6 in. PURIFIER, and the necessary Valves, Connections, &c.

Further Particulars may be obtained of JOHN DARNEY, Manager, FAVERSHAM.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company so far as they relate to the DEBENTURE STOCK WILL BE CLOSED at Ten o'clock forenoon on Friday, the 14th inst., and will be re-opened on Friday, the 28th inst.

The Interest for the Half Year to the 30th of June, 1895, will be payable on the 1st day of July next to the Proprietors registered on the closing of the Books.

By order of the Board,
JAMES RANDALL,
Secretary.

Gas Offices, Willoughby Lane,
Tottenham, June 7, 1895.

By order of the Directors of the Lea Bridge District Gas Company, £4000 4 per cent. PERPETUAL DEBENTURE STOCK of this Company, to be created and issued under the Provisions of the Lea Bridge District Gas Act, 1878, and offering to Trustees and others an Investment of the highest class, for Sale by Auction by

MR. ALFRED RICHARDS, at the Mart, E.C., on Thursday, June 20, at Two o'clock precisely in lots.

Particulars of the SECRETARY of the Company, 3, JEFFREYS SQUARE, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

NOTICE.

The Incandescent Gas-Light Company, Limited, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

"The Incandescent Gas-Light Company, Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, **Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—**

"The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others*, **the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.**

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.

"BEAR CREEK" CANNEL.

LOG MOUNTAIN COAL, COKE, AND TIMBER CO.,
PINEVILLE, KENTUCKY, U.S.A.
Cable Address: "Hull, Pineville."

LONDON AGENTS:
W. J. WILSON & Co., Suffolk House Cannon St., E.C.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.

The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.

These Appliances can now be obtained solely of the undersigned.

Winchester House, London, E.C. J. A. KELMAN.

AUSTRALIAN BOGHEAD.

Practical Results in Ordinary Working:—

Gas per Ton . . .	15,100 Cub. Ft.
Illuminating Power . .	45·6 Candles.

For Samples and Prices, f.o.b. London or c.i.f. to Continental Ports, apply to

THOMAS RAISON & Co.,
117, LEADENHALL STREET, E.C.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

The LAW GUARANTEE & TRUST SOCIETY,
LIMITED,
GUARANTEES FIDELITY.

Send for complete Prospectus, containing Balance-Sheet, Copy of Policy, &c., &c.

HEAD OFFICE:
49, CHANCERY LANE, LONDON, W.C.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton . .	11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.	
Coke (of good & pure quality)	$13\frac{3}{4}$ Cwt. Per Ton.
Sulphur	A little over 1 Per Cent.
Ash	Under 1 Per Cent.
Tar	163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . .	10,500 Cubic Feet.
Illuminating Power .	17 Stand. Sperm Candl.
Coke (of excellent quality) .	$13\frac{1}{2}$ Cwt. Per Ton.
Sulphur	1·13 Per Cent.
Ash.	1·34 Per Cent.
Tar	180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	$94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

LOW MOOR BLACK BED GAS COAL.

YIELD OF GAS PER TON · 10,375 CUBIC FEET.
ILLUMINATING POWER · 17·50 SPERM CANDLES.
COKE · · · · · · · 75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

GEORGE & JOHN HAIGH,
RAVENS LODGE AND CONYERS' COLLIERIES,
DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

PIPES, 2-in. to 8-in. PIPES, 2-in. to 8-in. PIPES.

MONIER-WILLIAMS & Co.
IRONFOUNDERS,
MIDDLESBROUGH.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, San Paulo Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON, FITTER.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY, LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

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ALFRED WILLIAMS & Co.
71, 72 & 73, BANKSIDE, SOUTHWARK, LONDON S.E.

GAS Engineers & Contractors.
WATER
RETORT SETTING
MAIN LAYING
PLANS & ESTIMATES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

TROTTER, HAINES, & CORBETT,

Brattell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY,
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

HUNTER'S OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF
NATURAL IRISH BOG ORE.
This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.
Samples and Prices on application.
11, BAY STREET, PORT GLASGOW.
Telegrams: "HUNTER, PORT GLASGOW."
Established 1872.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO.,
Central Plumbing Works, Town Hall Square,
BOLTON.
Practical Makers of all kinds of Saturators, and Specialists in every description of Lead Work required in connection with Sulphate Plants.
Special attention to Repairs.
Improved Lead-Burning Machines, Sulphate Bagging Machines, Copper Scoops, &c.
HIGHEST REFERENCES ON APPLICATION.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co. Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2 73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

GAS PURIFICATION.

Best Absorbent of Sulphuretted Hydrogen, &c.

JAMES E. CAMPBELL,
Patentee and Manufacturer,
96, MILL STREET, BRADFORD, MANCHESTER.

PRICES, &c., ON APPLICATION.

KENT'S THICK GAS COAL

RAISED AT

The Wharncliffe Woodmoor Colliery, BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1)	1·276
Weight of One Cubic Foot	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1 96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12 2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to the

Wharncliffe Woodmoor Colliery Co LIMITED,
BARNSLEY;
Or to **Mr. W. H. HARVEY,**
17, Old Queen Street, Westminster, S.W.

SELF-SEALING MOUTHPIECES

Made strong for Horizontal and Inclined Retorts in Round, Oval, and ⌂ shapes, and to open at Right Angles for Machine Work. Faced in Ruscoe's Patented Machines; thus ensuring correct and smooth joints when closed.

TESTIMONIALS.

Sheffield United Gaslight Company, Commercial Street, Sheffield, 11th April, 1895.

DEAR SIR,—In reply to your enquiry, I have pleasure in saying that we have a number of your Retort Mouthpieces at work, and that they give perfect satisfaction. Yours faithfully,
FLETCHER W. STEVENSON,
Engineer.
Mr. JOHN RUSCOE.

Leigh Urban District Council, Gas & Water Departments, Leigh, Lancs., April 11th, 1895.

DEAR SIR,—In reply to yours of yesterday, I have pleasure in testifying that the Retort Mouthpieces which you supplied to the Leigh Gas-Works seven years ago have given every satisfaction. We have now 267 of the Mouthpieces erected, and hitherto none have required refacing. Yours faithfully,
A. T. FLETCHER.
Mr. J. RUSCOE, Albion Works, Hyde.

FOR PARTICULARS APPLY TO **JOHN RUSCOE, ALBION WORKS, HYDE.**

CANNEL AND GAS COALS,

Rich in Illuminating Power and Quantity of Gas and Residuals.

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111, ST. VINCENT STREET,

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48, WELLINGTON STREET,

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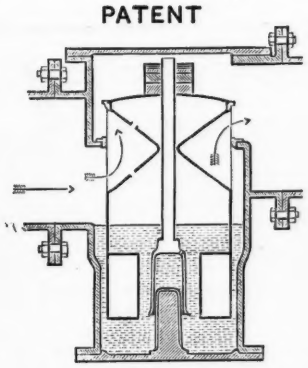
PATENT



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During the past Two Years have installed their

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At TORONTO, One Set. BELLEVILLE, One Set. OTTAWA, One Set.
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And have remodelled at LINDSAY, One Set; BRANTFORD, One Set.

Second Contracts.

TORONTO, Four Sets remodelled; originally of the type now being erected in Great Britain.
OTTAWA, One Additional Set. MONTREAL, One Additional Set.

Now Constructing.

BLACKBURN, Two Sets; COLCHESTER, One Set; and remodelling PETERBOROUGH (Canada) Works.

In addition to which the previous Installations of The Gaslight and Coke Company were carried out by THE UNITED GAS IMPROVEMENT COMPANY OF AMERICA, of which Messrs. MERRIFIELD AND WESTCOTT were late Engineers.

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OF EVERY DESCRIPTION.

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

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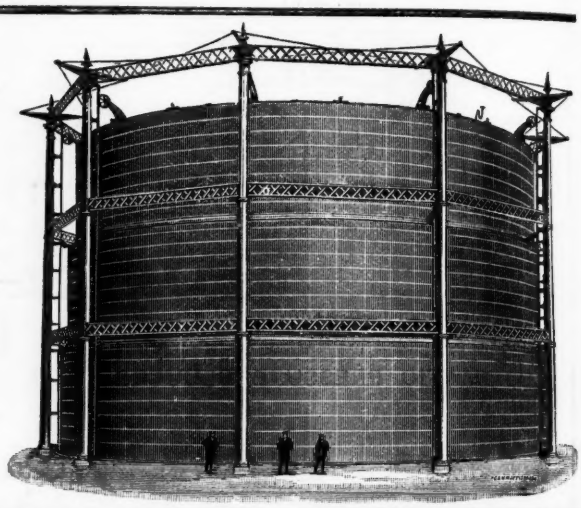

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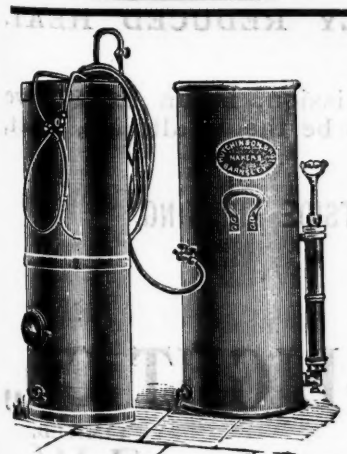
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COVERS THE INITIAL COST OF THE BURNERS IN FROM SIX TO EIGHT MONTHS.

The PRICES have been REDUCED as follows—

The Ordinary "C" Burner	**Price 10s. 6d.**
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Prices of other Patterns reduced proportionately.

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Which, with a Consumption of 2¼ Cubic Feet of Gas an hour, gives a light of 25 to 30 Candle Power.

This Pattern is particularly recommended where it is desired to effect a large saving in Gas rather than to effect a great increase in the Light.

The attention of Gas Managers and Gas Engineers is called to this System of Lighting as one which tends to Popularize the use of Gas as an Illuminant, owing to the following Advantages—

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CARBURETTED WATER-GAS PLANTS

Of the following daily capacities:—

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And have now under Contract:—

Belfast (Second Contract)	3,500,000 Cub. Ft.	Southport	750,000 Cub. Ft.
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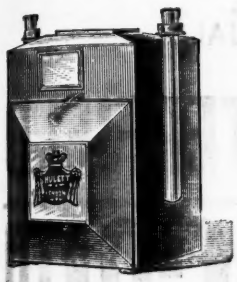

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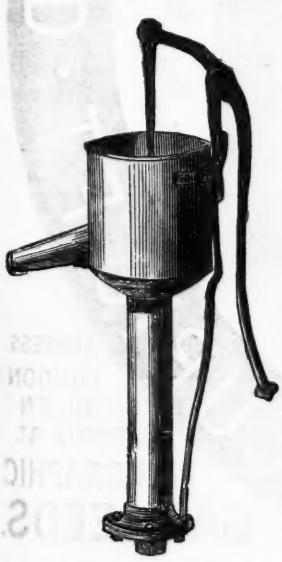

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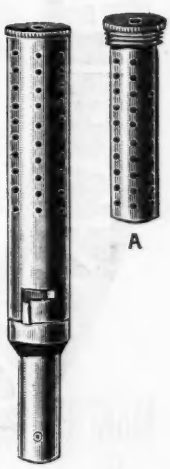

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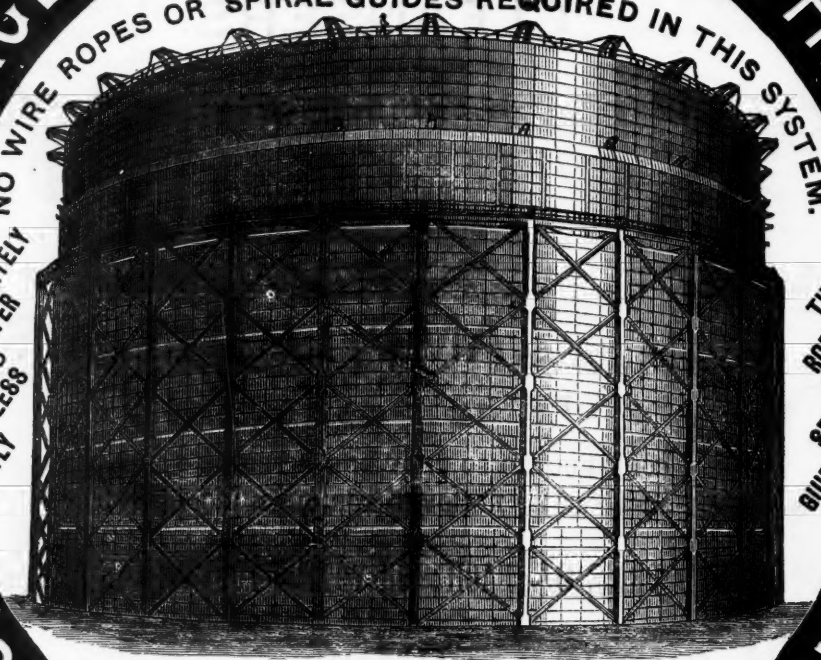

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The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.
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Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

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Manufacture & supply best quality of

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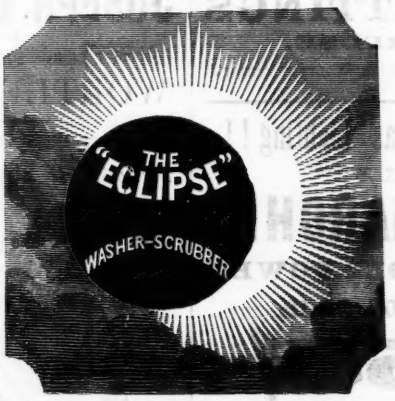

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